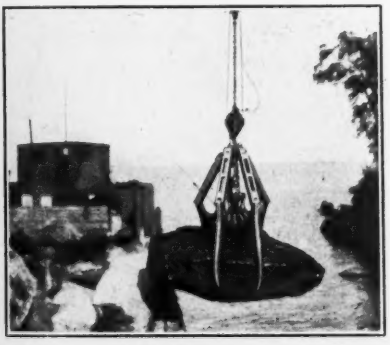
Pit and Quarry

SAND ▪ GRAVEL ▪ STONE

HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

Powerful Stone Grapple



Used by Contractors on the

GREAT LAKES

In Building Breakwaters

This Grapple, built with forged fingers having tool steel points, will handle rocks up to twenty-five tons.

QUARRY GRAPPLE

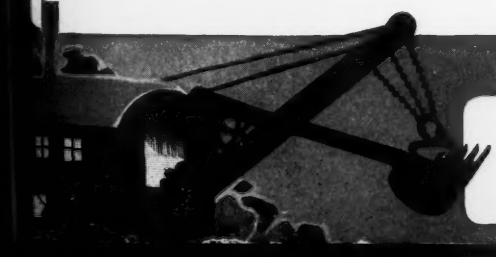
THE QUARRY GRAPPLE

has capacity for a six or seven ton rock. Designed for use in stone quarries for picking up larger size stones. Has manganese steel castings or calks at lower extremities of the fingers, made separate and renewable.

Built by

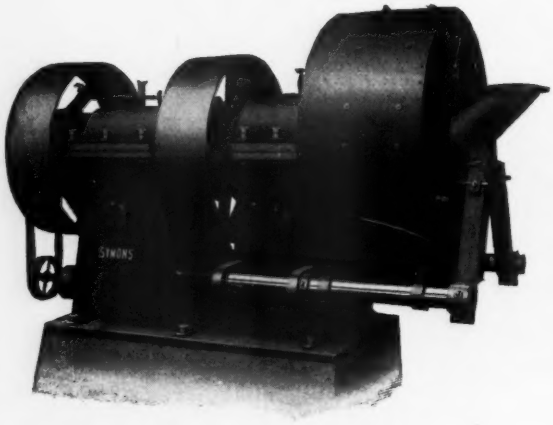
Superior Iron Works Co.

SUPERIOR, WIS.



MAY 1917

Symons Disc Crusher



THE IDEAL CRUSHER FOR GRAVEL, SAND, ROCK

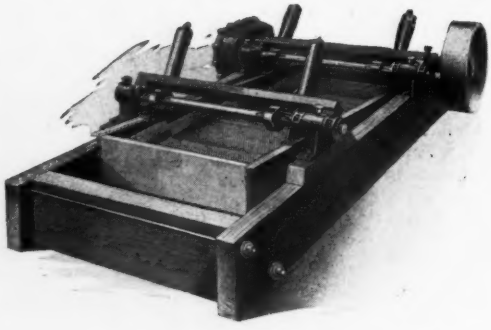
Large Capacity Uniform Size.

In Operation in Nearly Every State

BUILT IN FOLLOWING SIZES.

Size	18 inches	Capacity	5 to 15	Tons	Per	Hour
"	24 "	"	12 to 30	"	"	"
"	36 "	"	25 to 65	"	"	"
"	48 "	"	45 to 120	"	"	"

Simons Pulsating Screens



HALF THE COST OF A REVOLVING SCREEN

Larger Capacity
Less Repairs
Less Floor Space

MANUFACTURED AND SOLD ONLY BY

CHALMERS & WILLIAMS

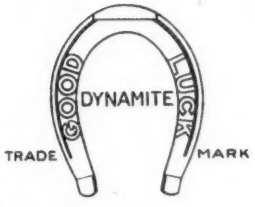
1500 ARNOLD STREET

Chicago Heights, Illinois

BURTON
POWDER COMPANY

Manufacturers of

DYNAMITES
PERMISSIBLES
BLACK POWDER



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Use No Power
Save Your Money
with the
SELLAR
GRAVEL WASHER

WASHED AND SCOURED

The Sellar Gravel Washer requires no power. Gravity runs it, and therefore the cost of operation is no more than that of supplying the washer with water and gravel. The initial outlay is small.

EFFICIENT The Sellar Gravel Washer is simply a flume with a metal false bottom with Johnson Non-Clogging Perforations and a solid metal bottom that carries the sand and silt. It is set at a slant of 1 inch fall per foot. The gravel is let in at the high end and washed down through the flume with water. The sand falls through the perforations; the gravel remains in the upper section. In rolling through the flume and passing through the water, the gravel is perfectly scoured and washed.

The Johnson Non-Clogging Screen

PORTABLE The Sellar Gravel Washer is a model of portability. It is made in 8-foot sections, and operates efficiently in 16, 24, 32 ft. combinations, etc. It's just the thing for washing on the job; saving the difference in price between washed and unwashed gravel. Though very strong, it is not heavy.

BIG CAPACITY With a standard screen and a water supply of 400 gallons per minute the Sellar will wash 150 tons a day.

DURABLE The Sellar Gravel Washer is all steel. It has no moving parts to wear out and cause trouble. In short, it is the greatest little gravel washer ever produced.

Write us for particulars

SELLAR SUPPLY COMPANY

Everything for Pit and Quarry Operators

557-559 West Quincy Street CHICAGO, ILL.

Probably you have never fully appreciated the immense economical value of

Oxweld

EQUIPMENT to Pit or Quarry Operators

FIND OUT!

Breakage of crushers, hoists, pumps, shovels, washing and screening mechanism may be quickly and inexpensively repaired with the Oxweld Welding Blow Pipe. The illustration above shows a Centre Casting from a Steam Shovel being repaired; its cost to replace would have been $300, its cost to repair with Oxweld equipment was considerably less than one-tenth that amount.

You may benefit by Oxweld efficiency, either through equipping yourself or by taking advantage of our repair stations at Chicago and Newark, N. J., the two largest in the Untied States. We shall be pleased to send you particulars regarding both methods, on request. Ask for Bulletin 508.

OXWELD ACETYLENE COMPANY

NEWARK, N. J. CHICAGO LOS ANGELES

The Meaning of 40% Dynamite

MANY users of explosives do not know what the percentage markings on cases and cartridges mean. They know that 40% dynamite is stronger than 30% and 50% is stronger than 40%, but do not know what these figures actually represent.

The first dynamites contained only nitroglycerin and an absorbent. Forty per cent. meant that 40% of the contents was nitroglycerin. Today this is true of straight nitroglycerin dynamite. But on other grades the percentage figures refer to strength, not contents, and it is strength that is important to you. Any dynamite honestly marked today is as strong as dynamite actually containing an amount of nitroglycerin equal to the percentage figures.

Hercules 40% nitroglycerin dynamite contains 40% nitroglycerin and Hercules 40% Ammonia and Gelatin dynamites have the same strength and will do the same amount of work pound for pound. Cartridge for cartridge, Hercules Gelatin is stronger because it is heavier.

With the exception of some special grades, of strengths well known to those who use them, the strength of Hercules Dynamites is always clearly marked on the cases and cartridges, and the goods correspond exactly to the markings. In purchasing Hercules explosives you run no risk. Honest products, truthfully marked, have won universal confidence in Hercules goods.

If you are interested in goods of this character, we shall be glad to hear from you.

HERCULES POWDER CO.

Wilmington **Delaware**

HERCULES EXPLOSIVES

Service is no side-issue with ATLAS. Personal service to every man who has blasting to do is the bone and sinew of our success.

Our business is making explosives. Naturally we want to *sell more* explosives and make more money. We are achieving this result by giving to each individual customer an explosive that will produce the best results at the least cost.

ATLAS service makes your blasting more efficient, more economical. It cuts the cost by making your explosives do more and better work for less money.

More than a century of experience in the manufacture of explosives is at our command—*and at your command.*

Whatever your blasting problems may be, our entire organization will work shoulder to shoulder with you to solve them.

ATLAS POWDER COMPANY

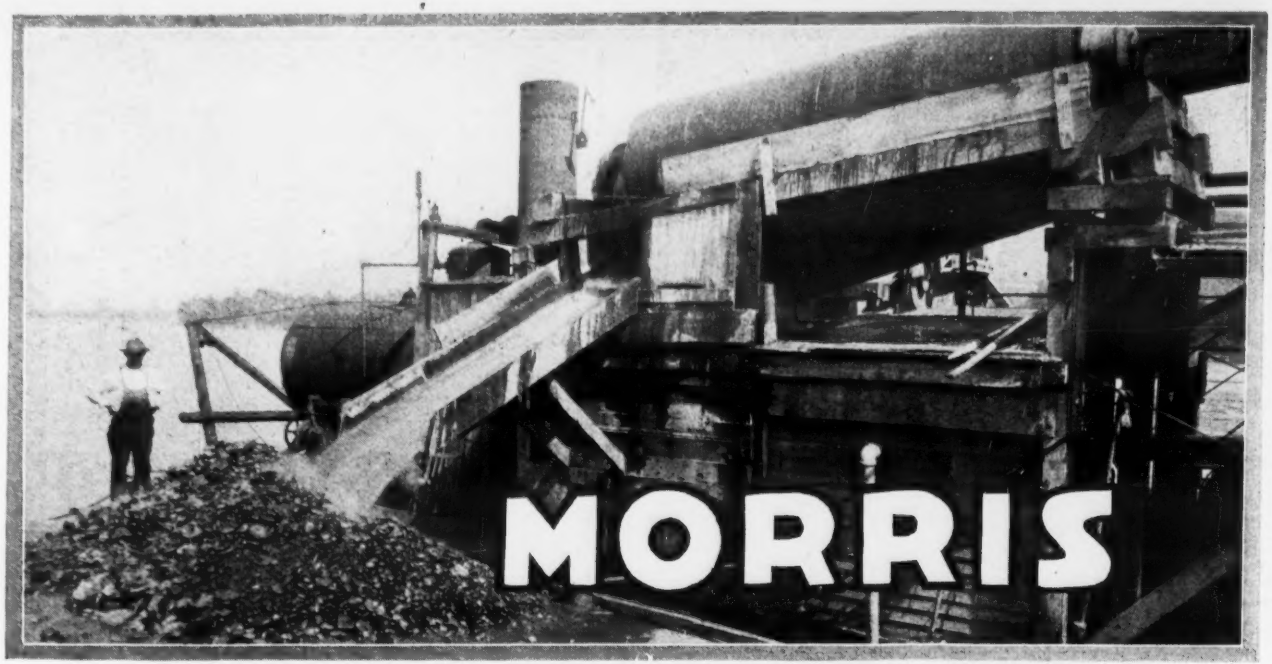
Home Office: Wilmington, Del.

Sales Offices: Allentown, Pa.; Birmingham, Ala.; Boston, Chicago, Houghton, Mich.; Joplin, Mo.; Kansas City, Knoxville, McAlester, Okla.; Nashville, New Orleans, New York, Philadelphia, Pittsburg, Kan.; Pittsburgh, Pa.; St. Louis, Wilkes-Barre, Pa

A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT

Put your blasting problems up to us

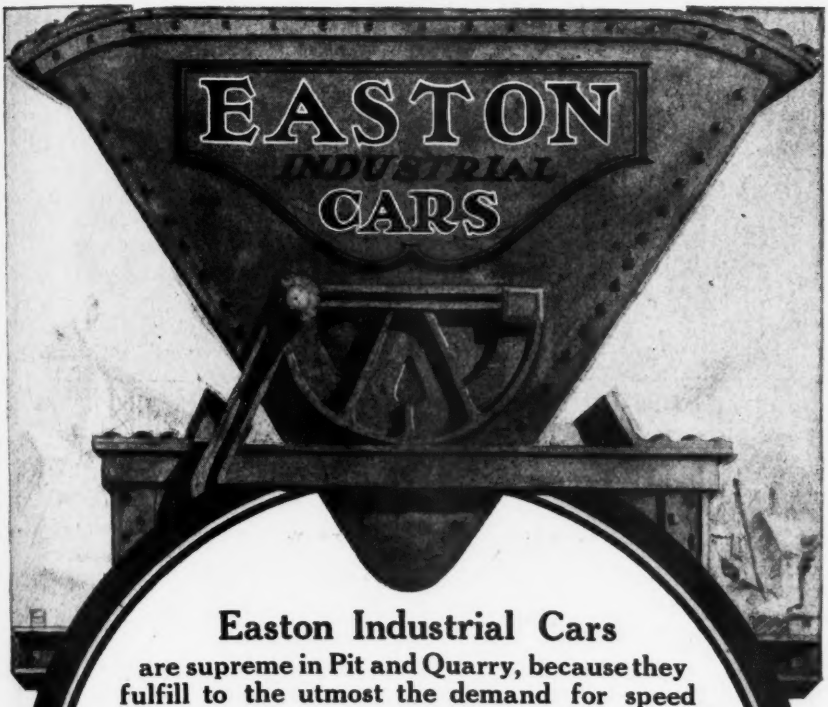
Our Service Department is a clearing house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to your own blasting. WRITE TODAY



Plant of D. N. Thomas Sand & Gravel Co., Williamsport, Pa.

Produced 60,000 cu. yds. in two seasons without one cent for repairs

THEY USE MORRIS PUMPS—DO YOU? **MORRIS MACHINE WORKS, Baldwinsville, N. Y.**



Easton Industrial Cars

are supreme in Pit and Quarry, because they fulfill to the utmost the demand for speed and convenience of operation, and long life of service. They may be had in Double Side Dumping or Double End Dumping form; devices for automatic return to upright position or remaining dumped may be adjusted to suit the nature of the materials and work, and rigid locking mechanism prohibit dumping at the wrong time or to the wrong side. They are all steel. Bearings are dust proof.

The reputation for service established by Easton Double Dump Cars extends as well to our Industrial Cars of all kinds, Track, Rails, Wheels and Accessories.

Ask for pamphlet 100-P covering equipment for operators of pits and quarries.

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TRACK AND
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Designers and Builders of Industrial Cars and Track

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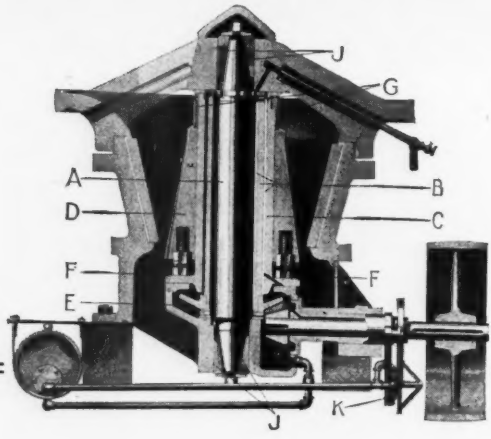
OFFICES: NEW YORK, BOSTON, CHICAGO, DETROIT, PITTSBURGH



A

—is the rigid shaft of the Telsmith Primary Breaker. This shaft doesn't turn or gyrate. It's like a big bolt through frame and crown, with the taper bushings (J) to hold it tight at top and bottom. Between supports, the length of the shaft is only a shade over four times the diameter. Break it? You *can't* do it. Crystallize? Not in ten years of the hardest work.

B

—is the Telsmith sleeve eccentric, rotating on the shaft. The eccentric is almost as long as the crusher. The bearings are four to five times larger than in other gyratory crushers. The working load is well distributed by the long headliner (C). The babbitt is drenched in oil, by the gear pump (K).

D

—is a conical crushing cone, gyrated horizontally by the eccentric which rotates within it. This head *does not turn.* It *gyrates,* but with a *parallel movement.* The crushing "pinch" is as long at the top of the bowl as at the bottom. Watch it grab and annihilate the big chunks. Notice the diameter and length of both head and concaves. The work is well distributed over these big wearing surfaces, by the "Telsmith parallel pinch." Why not? *Why not?* Why not get our catalogue No. 161A?

SMITH ENGINEERING WORKS

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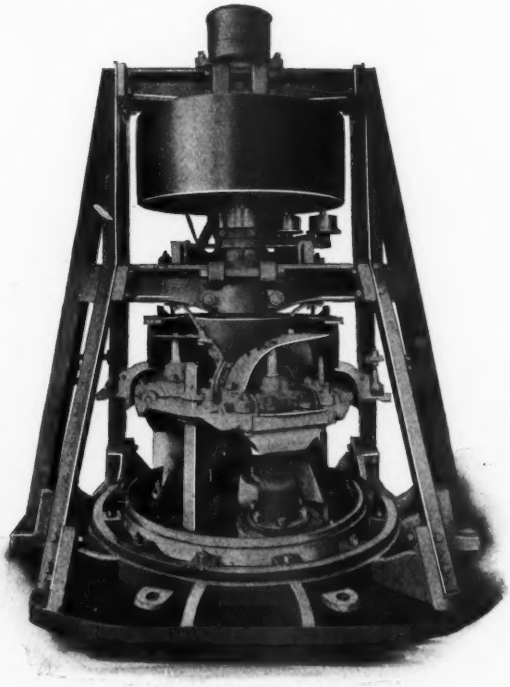
Agricultural Limestone

Must Be Uniform and Finely Pulverized to Meet the Demands of the Farmer

THE

BRADLEY THREE ROLL MILL

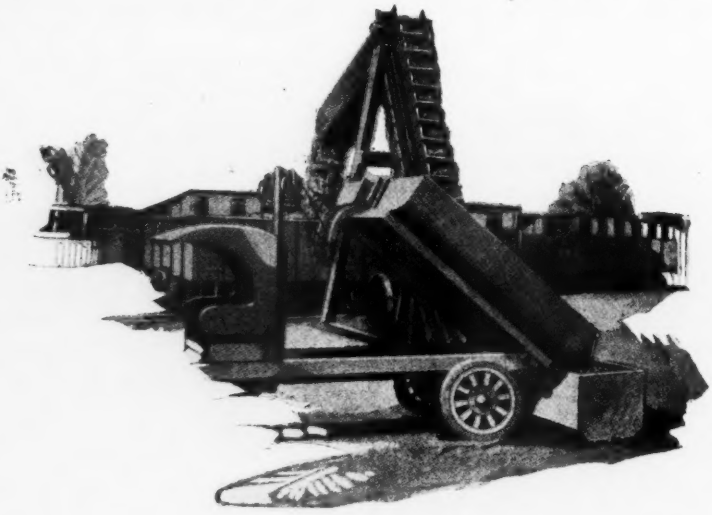
Produces This Fine Pulverized Material in Single Operation at an Extremely Low Cost for Production. It Takes Limestone 1" and Under, Delivering Finished Product which Is Ready for Shipping.



Send for sample of Ground Material Catalog and Full Data. Many of the Largest Agricultural Limestone Producers Claim This Machine Is Without an Equal.

Bradley Pulverizer Co.

Works: Allentown, Pa. **BOSTON**



It costs you just 25c to load that 50-ton car with a SUNBURY

Just one gallon of gasoline—no more. Started the engine in the morning, dumped a truckload in the bin—went after another—and when he got back the first load was in the car. This was repeated until the car was loaded—in ONE HOUR. Pretty quick work! That's what makes your trucks valuable. You'll have to *hustle them* to keep up with a Sunbury.

It loads and it unloads.

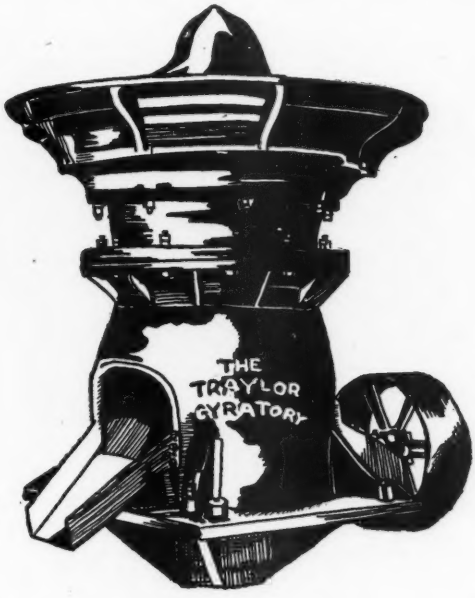
You can buy one that you can use for both and it won't cost you one cent more. Write for detailed description.

THE SUNBURY MANUFACTURING CO.

HOME OFFICE and FACTORY:

SUNBURY, OHIO

TRAYLOR
GYRATORY CRUSHERS



Combine more Good Features than any other Gyratory built

An extra large Eccentric, greater in diameter and longer than others.

A shaft 25% larger in diameter than others.

A perfect all-steel suspension at the point of least motion, giving a perfect rolling motion to the shaft.

Lubricating system that forces all dirt from the eccentric cavity, assures a cool running and long lived eccentric.

These and many other points of superiority assure you of the

MAXIMUM OUTPUT

Bulletin G-3 will interest you. Send for it.

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Large or Small

propositions are handled by us with equal facility and efficiency, by reason of our experience, methods and superior organization. We have designed and supervised some of the largest propositions in this country and also some of the smallest. In every case we have absolutely satisfied our clients. Our plants pay dividends.

WE ARE PRIMARILY ENGINEERS AND SPECIALISTS IN SELECTING EQUIPMENT.

We Specialize in heavy duty Automatic operation.

INVESTIGATE OUR LIME HYDRATOR AND POIDOMETERS.

Portable Crushing Plant, 100 tons per hr. capacity

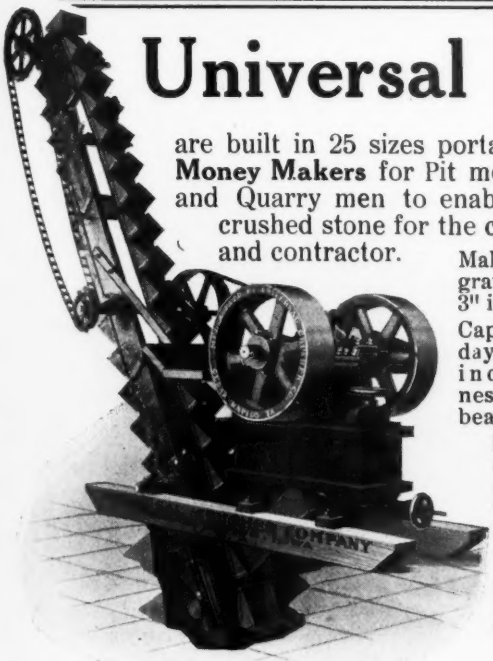
THE SCHAFFER ENGINEERING AND EQUIPMENT CO., Tiffin, Ohio, U.S.A.

SAND-DREDGING PUMPS

Hetherington & Berner Belt Driven, Sand and Gravel or Dredging Pumps are designed and made according to the most improved ideas, for heavy duty. The Pump Shell is a one-piece semi-steel casting reinforced at points of greatest wear, much heavier than shell of any other pump on the market. Heavy semi-steel piston, lined with steel plates; heavy, rigid frame; Suction Elbow has hand-hole plate, ejector for steam priming flap valve, etc.

HETHERINGTON & BERNER
Indianapolis, Ind.

Tabulation under uses and a complete description of both Dredging and Water Pumps makes our **Circular A-10** an invaluable ready-reference guide. It is ready to be mailed you at once—free. Drop us a postal requesting it.



Universal Crushers

are built in 25 sizes portable or stationary, and are **Money Makers** for Pit men to crush their oversize and Quarry men to enable them to produce small crushed stone for the concrete man, road builder and contractor.

Makes a product from oversize gravel or Quarry rock from ¼ to 3" in one operation.

Capacities from 5 to 300 tons per day. Jaw openings 5x6 to 14x24 inches equipped with manganese jaws and removable bronze bearings.

Send for Catalogue of full line of Universal and Eureka crushers, rolls for fine grinding, Elevators and screens of all sizes, also full line of Universal Brainard Pulverizers.

UNIVERSAL CRUSHER CO.
200 Third Street, Cedar Rapids
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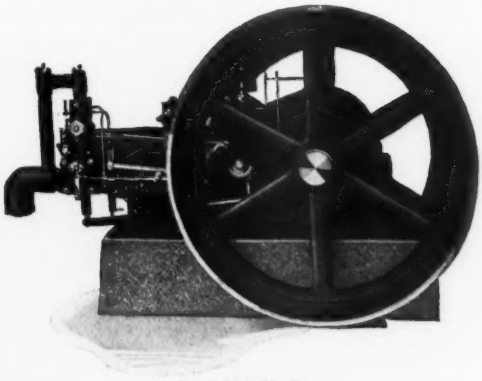
CHARTER OIL ENGINES

Will pump your water, wash your sand and gravel, crush your rock and stone, at less cost than you can possibly do it for by using steam or electricity

The Logical Power for Isolated Plants



Operate on Low Priced Fuels

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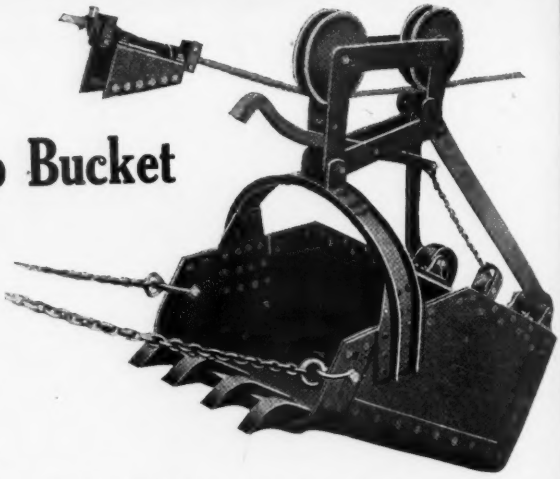
10-96 FIRST AVENUE **STERLING, ILLINOIS**

The Pioneer Back Dump Bucket



for slack cable excavation of sand and gravel, as well as miscellaneous excavation.

Our booklet "PIONEER EXCAVATING OUTFITS" is free, send for it.

The Mansfield Engineering Co.

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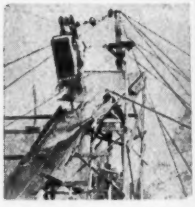
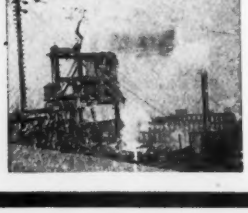
EVERY PLANT IS A PAYING PLANT THAT IS A NEGLEY PLANT



Competition is a comparison of production costs.

You sand and gravel men make or break your business with your equipment. Excavate and convey at low cost—and your success is assured.

Sand and Gravel Plants that are held up to the trade as notable examples of efficiency methods, employ the NEGLEY PATENTED EXCAVATOR. It operates on a slack cable-way with a two drum friction engine, and requires only three feet six inches clearance.



That NEGLEY EXCAVATORS accomplish the highest economy and possesses a *permanent* efficiency is well known. Their adaptability to *your* needs we will be glad to show you on request. Write us today.

INDIANAPOLIS CABLE EXCAVATOR CO.

403 K. of P. Bldg., Indianapolis, Ind.

Pit and Quarry

Vol. I **MAY, 1917** **No. 4**

A Bi-Monthly Journal for Producers and Marketers of Sand, Gravel and Stone.

Subscription Price $1.00 *Per Year.*

Address Pit and Quarry, 527 S. La Salle St., Chicago. Tel. Harrison 6729.

One of the first effects of the war is the spending of seven billion dollars right in this country. Some one is going to get it and the ones who get their share will have to be doing business from start to finish. The money will go largely to established concerns, which have proven their right to be called leaders in their line. Whether business is good or better depends on your organization and ability to keep up with the demand.

A lot of men and companies will get rich through the war. It will be found that they are the ones who did the big volume of business, and in most cases they will be entitled to all they get.

We believe that the capable man has nothing to fear during the coming months. There will be times of trial, but integrity will win out in the end.

Limestone quarries will find it to their advantage to study up on the subject of ground limestone for agricultural purposes. A low lime content in the soil shows in clover failure, and the growth of sorrel, plantain and other worthless vegetation. A ton of ground limestone per acre is not too much to apply, and this is equivalent to 1300 pounds of slaked or hydrated lime. Where a long shipment must be made there is economy in the hydrated lime, and the quarry man can thus reach his market by either route.

The merits of crushed gravel are becoming known to those interested in macadam pavements. Gravel has an advantage over many forms of crushed stone in that it is harder and less subject to breaking up under the heavy road traffic. Crushing the gravel brings it all to the desired sizes and permits a much better bonding of the materials, hence a longer life to the road.

The Dunbar Stone Co. of Detroit, found it possible to dodge the car shortage by employing motor trucks to deliver crushed stone and sand to their customers. A saving in cost was also found over the method of shipping by cars or boats and delivering with horse-drawn vehicles.

There seems to be too much guesswork about selling sand and gravel. One sells by the ton, another by the yard, and a third by the load. In the first the dampness of the material will affect the quantity, and the same with the second, while the third depends on the generosity or judgment of the loader.

As it comes from the pit or the bin, the material is never dry, so allowance must be made for that. On the other hand, a heavy rain will settle a scow load of sand so that it will measure yards less than when freshly loaded.

Perhaps it is just as well that engineers, architects and contractors are

getting particular as to their requirements. To use their formulas for strength, etc., the materials must be right, and the pit owner must be prepared to screen and wash and grade his product to meet the specifications. A reputation for furnishing extra quality promptly will soon have a good effect on business. Quotations will rise with quality.

No one makes a permanent profit on short weight, measure or count. A brick dealer who sold extra large brick called attention to the greater weight and volume of a thousand. He went out of business when it was found his wagons would not carry a full thousand brick. He was one of the class who thought he could fool every contractor all the time.

How many pit owners and quarry men have photographs of constructions in which their materials were used? One in a hundred, perhaps, and his list is not complete. Every piece of concrete road, every sidewalk, every building should be an advertisement for the man who furnished the materials just as much as for the contractor who supplied the labor. Better have a few photographs handy and talk about the quality of your goods as well as the price at which you can deliver them.

With the present high price of explosives, especially dynamite, quarrymen's attention should be directed to a more economical use of explosives and whenever possible the substitution of some other powder for dynamite.

During the past decade crushed stone quarrymen have become accustomed to using dynamite exclusively. This has been due to the fact that it is easily handled and stored, can be used in many blasts without springing and has been fairly cheap. Thus it has been used extravagantly. It has been common to read of blasting, where from half a yard to one and a half yards only had been loosened with a pound of dynamite. A good blast should show from a yard and a half to two cubic yards loosened with a pound.

Every quarry owner and superintendent should study his methods of blasting and of spacing and drilling holes in order to do more economical and effective blasting. This alone would mean the saving of much explosive.

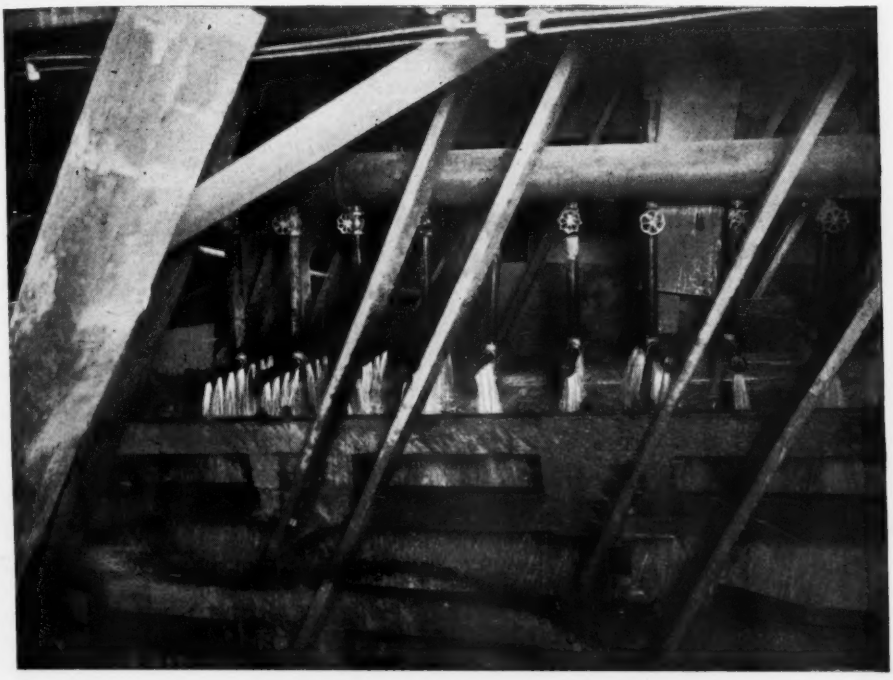
Ammonia dynamite can be used instead of nitro-glycerine or gelatin compounds, thus saving from two to five cents per pound for the same strength of explosive. Many quarrymen seem to have a prejudice against ammonia goods, but where the dynamite is not stored long there is little difference and the nitro-glycerine is not worth, over ammonia, the extra price paid.

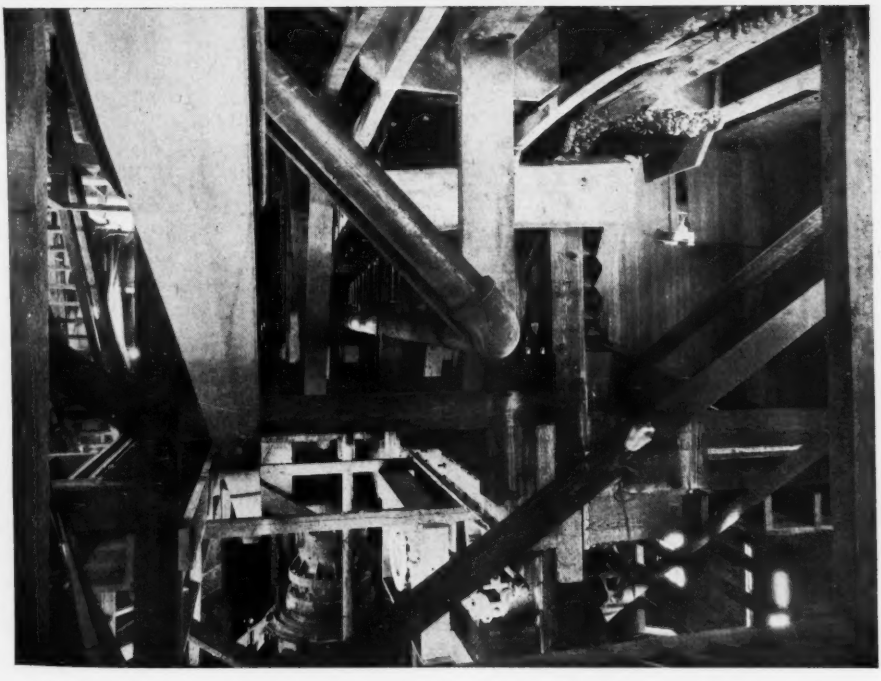
A further saving can be effected in large blasts by using contractor's powders, Judson or similar blasting compounds. These powders have great pulverizing power and, costing much less than even ammonia dynamite, will do effective blasting at a greatly reduced cost. On some cases it is even feasible to use black powder.

From all indications the season of 1917 is to be a banner year for quarry products. Not only will much private work be done, but the amount of public work will be enormous and stone will be used for many purposes. The national government will use much stone.

Quarrymen should be alert for this business and have their plants in order so as to obtain the maximum output with the minimum of labor. Labor is likely to be so scarce that every labor-saving device that can be used should be installed at once.

The same thing is true of those operating sand and gravel pits.





Two Interior Views of the Plant of the California Building Materials Co., Oakland, Cal.

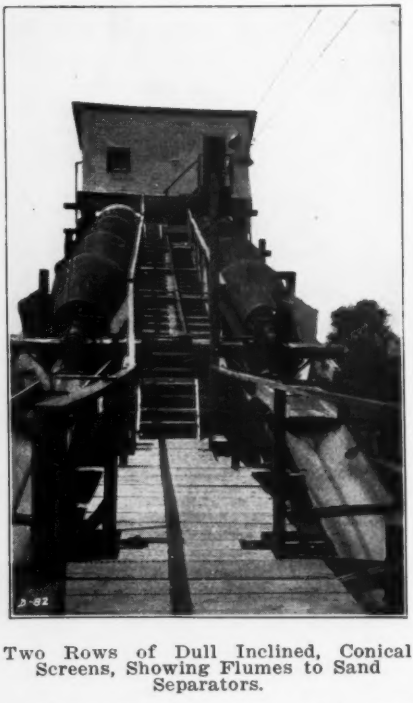
PREPARING ROCK MATERIALS FOR THE MARKET

Extracts from a Paper Before the Western Society of Engineers.

BY RAYMOND W. DULL,
President the Raymond W. Dull Company, Chicago.

Sand and gravel or crushed rock plants just a few years ago consisted of a combination of individual ideas, local practice, market requirements, theory, some engineering, common sense, and errors.

Local practice in many localities was satisfied with the use of bank run or crusher run variety of concrete materials with no particular care taken regarding percentages of voids, gradations or foreign matter. I would estimate that at the present time fully half of the gravel pits operating



Two Rows of Dull Inclined, Conical Screens, Showing Flumes to Sand Separators.

market their gravel just as it runs from the bank, all combined together, from 1½-inch stone to ¼-inch pebbles, some of it washed but without any regard to the amount of each size, just so it is gravel with the sand taken out.

It has been demonstrated that materials assembled in such proportions as to form the densest mass make the cheapest and strongest concrete. This, then, calls for the producer to grade his gravel in several sizes. The material can then be re-combined to approximate the densest mass.

Assuming, then, that it is desirable to grade the stone or gravel into several different sizes to recombine into the densest mass, we will discuss the best practice to make this separation. The general practice in coal screening, and in fact all dry screening processes, is to take out the fine materials first. This method retards the screening efficiency, because the large pieces of material cover to a great degree the opening in the screen and hinder the smaller particles from passing through. With the use of water and individual screens, it is possible to take out the largest particles first.

Greater screening efficiency is obtained in this manner, because when the first separation is made we have the greatest quantity to screen, and with the large size holes the material will more readily pass through the large holes than through the small holes and when we have screened down to the smaller sizes, which are more difficult to screen, we have only a small percentage of the material which we had at the start of the process.

We also find with this later system that the finer screens which are more delicate are not subject to as much wear since they are relieved of the large stone.

By using individual screens for making each separate size a trough or flume usually carries the material which passes through each screen by the aid of the washing water into the following screen. The water is then used over and over again as each size

Plant of Akron Sand and Gravel Co., Akron, Ohio, Showing Hopper, Crusher House and Conveyor Leading to Top of Plant. Crib Bins Reinforced with Railroad Iron.

of material is taken out which utilizes the water to the full advantage.

The correct principle of washing materials is to agitate the material and water sufficiently to get all the mud and other impurities in suspension in the water. If any free mud is left and is not in suspension the washing has not been thoroughly done and the materials will not be clean.

A few years ago the writer was confronted with the problem of designing gravel washing equipment and undertook to develop machinery best suited for the purpose. Engineers had given the matter very little attention and the gravel pit owners were either compelled to develop their own machinery or to use equipment on the market, very poorly adapted for the purpose. Shaker screens designed for coal screening or cylinder screens made for stone crushing were used principally.

Our final development of screens was the inclined conical screens, all mounted on an inclined shaft. Our reason for design the screens in this manner was to simplify the driving machinery for the individual screen arrangement. To install separate driving mechanism with the consequent wear was the first thing to avoid. The second condition was to give the inclination of the screening surface the best working angle, and the third condition to give the water pans for fluming from screen to screen the minimum possible slope and still carry the solids by the washing water. The last condition was necessary to keep the height of plant as low as possible and cheapen the cost of raising the material to the top of the plant.

Many materials do not always readily become clear without preliminary scrubbing. We found it advisable to devise something to agitate the materials and scour the stone to a considerable extent before going into the washing screens.

The scrubber consists of a large cylinder mounted on the extension of the screen shaft axis and driven by the same gears. The cylinder is divided by internal rings which retain the material and water in the compartments and the lifting vanes agitate and scour the mass similar to the action of a concrete mixer. The mass overflows from one compartment to the next, and after passing through the four stages the preliminary work is accomplished.

In addition to the water first introduced we arrange several jets at the small ends of each screen, which flow in the opposite direction to the travel of the material. These jets wash off this muddy water, sand and other particles which cling to the stone.

We will now take up the separation of the sand from the muddy water. We made some extensive experiments to determine the best method of extraction of the sand. If the sand and water were run off together the water would soak through the sand and

leave the mud in the sand similar to a filter bed. By inverting this method and drawing off the water at the top and the sand below, we were able to obtain the desired results.

Our experiments determined that a conical shaped tank suspended on scale beam levers was the most efficient device. The scale beam levers have knife edges and are almost as sensitive as any scale. The cone valve at the lower point of the tank is connected with the counter-weight lever and an upward motion of the counter weight lowers the cone valve. If, then, sufficient sand accummulates or settles in the tank to cause the counter weight to rise, the cone valve drops and sand escapes from the tank to the bins below until the tank is relieved of the excess weight and the valve is automatically closed. The discharge is intermittent and there is a sufficient quantity of sand in the tank at all times to make a sand seal to prevent the water from going with the sand.

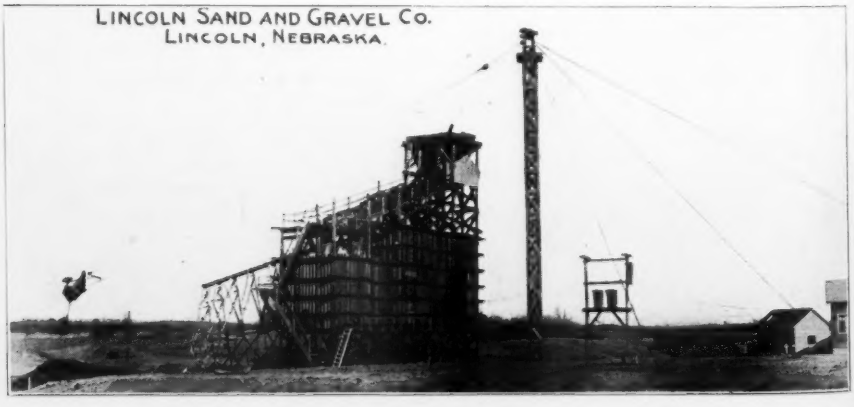
In some of the earlier plants we designed, we used the cribbed bin construction. We found that the life of the bins was short because the water would be held in the cracks between the planks and the wood would decay rapidly.

We then adopted a construction which did not have this fault, was more accessible for the replacement of timbers and provided means to perpetuate the life of the bins. In this type, vertical studding is used, with planking spiked on the inside and whallens on the outside of the studding to reinforce them. Heavy steel tie rods with large washers run through the waling from wall to wall to take care of the side pressures of the bin walls. The spacing of the studding and waling are closer together at the bottom of the bin and farther apart near the top where the pressure is not so great and in this way a minimum amount of lumber is used for the bins.

No floors are used in the bins. The material is put in the various bins and only the material above the flow angle of the gates is drawn off. The material below the gates forms the floor with the hopper effect leading to each gate. The bed of material also forms means for the escape of the water clinging to the material after washing and the material is loaded in the cars in a dryer state.

A few bins are made of reinforced concrete but this is not a very general practice. The reason is the increased cost and no great necessity for permanence.

We have also installed plants with circular steel tanks, but not since the price of steel has advanced to make



A Cableway Excavator with 600 Foot Span. Bucket Is Digger, Elevator and Conveyor in One.

this construction prohibitive.

Quite a variety of methods are used for excavating the material. One reason is that pit owners are often contractors who have purchased steam shovels or locomotive cranes and wish to use them rather than buy special equipment. The physical condition, also, is a great deciding factor on best method for excavating, and the other deciding factor is the capacity of the plant.

In some localities the material is taken from a river and calls for a cableway of 1,000 or even 1,500 feet span. Some of these cableways have travelling towers and others pivot about one tower and have the other tower mounted on circular tracks. River work is more or less hazardous, due to floods, and unless a floating plant is installed the cableway system is used with towers which are placed on opposite banks.

Another system of excavator which has become very popular where local conditions will permit, is the slack line cableway excavator. This system operates much faster than the other style of cableway. This style of excavator is installed with a main tower or mast at one end and an anchorage of some sort at the ground level at the other end. The bucket is suspended from a trolley which runs on the main track line. The machine is operated by a two-drum hoist. The main cable is raised and lowered by means of a block-and-fall arrangement, the cable from which leads to one of the drums of the hoist. Another cable, called the load or drag line, is attached to the bucket and leads to the other drum on the hoist.

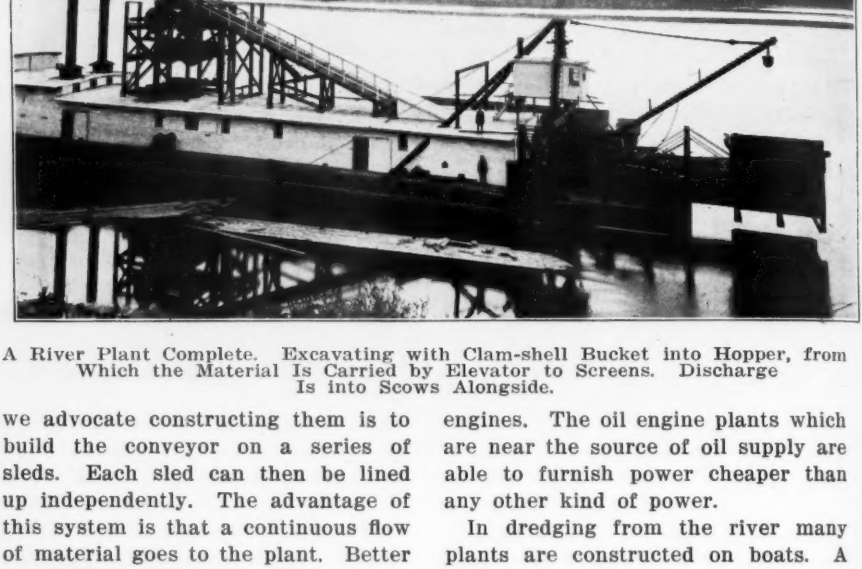
In operating, the bucket runs down the inclined main track line by releasing the clutch on the drum and controlling the drum by the brake. The descent of the bucket is very rapid, and only requires about ten seconds to travel 500 feet. When the bucket reaches the digging point the main track line is lowered until the bucket rests on the material. The bucket is loaded by pulling forward, and when full the main track line is raised and the bucket is brought to the dumping point.

A few plants are designed to take the cars which bring the material from the steam shovel up an inclined trestle by means of a hoist.

The usual arrangement for belt conveyors is from a track hopper into which cars dump and from the hopper the material is fed to the belt conveyor which carries it, to the top of the plant.

Another method used for bringing the material from the excavator to the plant is the field conveyor. The way

Dredge Pump. Mounted on Scow. Discharging Material into Concrete Sump, from Which It Is Lifted by Elevators to Screens.



A River Plant Complete. Excavating with Clam-shell Bucket into Hopper, from Which the Material Is Carried by Elevator to Screens. Discharge Is into Scows Alongside.

we advocate constructing them is to build the conveyor on a series of sleds. Each sled can then be lined up independently. The advantage of this system is that a continuous flow of material goes to the plant. Better screening results on account of this steady flow through the screens.

Most of the plants are electrically operated with small groups of driving connections for the smaller machines and individual drives for the larger units. Steam driven plants are also extensively used and a few use oil engines. The oil engine plants which are near the source of oil supply are able to furnish power cheaper than any other kind of power.

In dredging from the river many plants are constructed on boats. A complete washing plant for washing and grading and making a finished product delivers to several scows alongside the boat. Each scow receives a different grade and the waste material is run back into the river or lake.

These plants must also be designed

A Pumping Dredge. Discharge of Pump Is into De-watering Grizzly, Feeding Direct into Screens. Loading onto Scows Alongside.

to suit many different conditions. In some cases dredge pumps are used and where the material is too hard for pumping, orange-peel buckets are used. Dredging elevators are also used for this purpose.

This style of plant where a portion of the material to be excavated is below water level and material not packed too tight gives very efficient results. Many installations have gone wrong because they have attempted to pump to the top of the plant, which resulted in excessive power requirements and numerous mechanical and screening difficulties. We recommend pumping to the plant with pipe line as near horizontal as possible. The material can be dewatered in a concrete sump or basin and the material elevated to top of plant by means of dredging elevator. Take as an example, a dredge pump usually delivers 10 per cent solids and to raise 10 tons of water to get one ton of material is not a very efficient process.

The dredging elevator is fitted with manganese and chrome nickel wearing parts and dredges out the bottom of the sump in a continuous operation without much attention.

HARDPAN AND CLAY WE MAY STRIKE IN 1917.

An Address Before the Indiana Sand and Gravel Producers' Association.

E. GUY SUTTON,

General Manager, Carmichael Sand and Gravel Co., Williamsport, Ind.

In considering this subject it might be interesting to trace the geological history of Indiana, so far at least as it relates to the formation and disposition of gravel. However, suffice it to say in this regard that the glaciers were the first gravel producers to operate within the state. It was a cold proposition with them! The obstacles and unfavorable conditions which they met and overcame were many. In the course of their operations they employed giant crushers having infinite capacity and for which no boulder was too large. Enormous conveyors were used which, as their business expanded, stretched from beyond the Great Lakes to at least the southern part of the state, and while the speed of these material carriers was not great yet they were capable of carrying myriads of tons. Regardless of the advantage of an inexhaustible supply of water, the product of this "Glacial Gravel Company" was not clean enough to meet our present specification, and as a result of the crude and imperfect systems employed by them in washing and disposing of waste material we find in their storage piles deposits of deleterious matter in sufficient quantities to be a cause of rejection in the mind of any intelligent inspector.

The most objectionable by-product of this ancient gravel-producing agency frequently occurs in the form of clay or hard pan and is found in three locations with reference to the main deposit of gravel:

1. As an underlying strata.
2. As an overburden.
3. In irregular pockets or streaks.

The underlying strata of clay or hardpan—usually the latter—gives no great concern to the present-day operator except that it may limit the depth of his bank. The overburden may be a source of annoyance and expense to remove but it can be handled by ordinary methods of excavation. It is the irregular occurrence of clay within the body of gravel that causes the most trouble for reasons with which all sand and gravel producers are familiar, but the *uncertainty* of its appearance and its extent is no doubt the greatest cause of anxiety, for determinable obstacles are easy to over-

come in comparison with dealing with the indefinite, which is invariably an expensive and grievous task.

If this subject were to be treated literally it might at least be made entertaining, inasmuch as it would deal largely with natural phenomena, which are always interesting. But, however burdensome the conflict with Hardpan and Clay may be as an actual experience, yet there will be greater difficulties to overcome in the year 1917.

In August, 1914, the European war began. The world at large suffered the usual mental stages following a catastrophe—horror, tolerance, apathy. The first year of the war did not materially effect business conditions in the United States because no one could realize the extent of the conflict. It will be noted from your cost records that there was no signal increase in the cost of production during the season of 1915 over that of previous years. But as soon as men became awake to the fact that the war was an actuality; when the resources of the belligerents both as to the necessities of life and the means of death began to diminish and negotiations for the purchase of these supplies were started in the United States, then, as we all know, prices began to soar.

At the beginning of 1916, the steel mills, which are our national industrial barometer, commenced to work night and day. Many manufacturing concerns which had been operating with varying success began to assist in the making of munitions, and in a few months' time became financially independent. Railroad stocks advanced in prices because lines that previously were operating at a loss were able to show indications of paying dividends. The heavy demands for foodstuffs at home and abroad, including both hogs and cattle, together with the exportation of horses and mules, brought the farmer's products into unusual prominence. Inactive coal and mineral mines were re-opened, and these, together with the active ones, were worked to the limit of their capacity to furnish fuel and metals for the manufacture of more machines and the construction of greater buildings, that the wheels of industry might proceed. It was during this period also that emigration began and immigration ceased. If you will again refer to and compare your cost statement for 1916 with that of 1915 you will note, with some concern, no doubt, the result of this unusual stir in the industrial world.

But whatever surprise you may have felt and exhibited when confronted with such an odious comparison, you are yet not awake to the actual conditions unless you are preparing yourself for a greater shock when comparing time comes at the end of the season which is just before us. Last year our costs would have shown a greater increase had it not been that we had made favorable coal contracts and had laid in supplies and repairs early in the year, before the abnormal advance in prices had been made. Then, too, the scarcity and independability of labor came gradually; this year we will encounter, to begin with, not only a shortage of laborers, but also, on account of the great demand for men on the farm, in the factory, on the railroads and every other line of work, a spirit of independence, restlessness and discontent resulting in inefficiency; labor will not only cost more but it will be worth less.

Moreover, the best hope that the railroad officials give at the present time is that the car shortage will be as serious at the beginning of our operating season as it was at the close of last year. This opinion is supported by the following facts:

1. On account of the abnormal movement of freight, there is an actual shortage of cars suitable for shipping gravel.

2. Many cars are tied up by eastern

embargoes.

3. New equipment cannot be secured as fast as worn out cars and locomotives are retired.

4. The railroads are short of motive power both for road hauling and switching at terminals resulting in the slow movement of cars in transit and at destination.

5. Coal movements will continue in large quantities throughout the summer months because of the heavy demands of the railroads and factories; besides such domestic coal will be delivered to both dealers and consumers and no doubt storage will begin early in the fall on account of the anticipated miners' strike after April 1, 1918.

6. Many coal cars are now being used for the transportation of high class freight due to the shortage of box cars.

7. The present ruling that cars must move in the direction of "home" if it remains in effect, will operate to increase the shortage aside from its other complicating features.

Moreover, this anticipated car shortage will not only effect outgoing shipments but will delay deliveries of coal and other supplies used in the operation of the plant as well.

And so, considering only the car supply and the labor conditions the situation does not appear bright even to an optimist. But this is not all. You are already familiar with the advances that have been made in prices from your own experience in purchasing supplies, repairs and equipment so that a few examples of the rate of increase during the past year and a half will be sufficient to show the general trend with reference to prices of articles which enter into our cost of production: Nails have advanced 77%, bolts 154%, sheet steel 144%, manganese parts 47%; wire rope 40%, belting 17%, pipe fittings 62%. Moreover, a reduction in quality has been made in many articles which is equivalent to an advance in price. It is a known fact that some manufacturers have resorted to this practice in order that ostensibly they may have the reputation of maintaining former prices. New equipment has not only advanced in price from 20% to 100% but it is impossible to get reasonable deliveries of electric machines, boilers, steam shovels, locomotive cranes and industrial locomotives, all of which are prime requisites in the operation of most plants. This latter condition has placed second-hand equipment at a premium so that a used machine brings almost as much as new if it can be delivered promptly.

That the price of coal will range from $1.75 to $2.50 a ton at the mines, according to the grade, even for summer deliveries, is generally accepted. This is an advance in price of at least 100% above what was paid last year.

Though it will be impossible to reckon with any degree of accuracy just how much our cost of production will be affected by the conditions which now beset us, yet it may be worth while to make some sort of calculations, even if they be based on facts and fancies in indeterminate proportions. In analyzing the operation statement for 1916 of a firm operating a representative gravel plant in Indiana the items of cost were found to obtain as indicated below:

Item	Percentage of Cost	Estimated Rate of Increase	Percentage of Increase
Labor	32.1	25%	8.
Stripping	10.0	25%	2.5
Fuel	10.4	100%	10.4
Supplies & Repairs	14.7	50%	7.4
Expense	12.0	10%	1.2
Royalty	2.8	....	....
Depreciation	5.3	....	....
Administration	12.7	5%	.6
	100.0		30.1
Factor of Safety			10.0
			40.1

Though there may be a divergence of opinion as to what the advance will be for each item of cost this year as compared with last year, yet that there will be a material increase no one will deny. The firm from whose records the above percentages were obtained has estimated that the rate of increase will be as indicated in the foregoing table whereby it is determined that the total cost of production will be approximately 30% greater for 1917 than it was in 1916. There is no intelligent way to solve this question of uncertainty but that it must be considered in making estimates of cost is obvious. And so, arbitrarily we may add 10% to our percentages already obtained which might be termed a Factor of Safety.

The estimate of 40% advance which may have been obtained by a more or less illogical method may be far from right. To be prepared to meet the anticipated raise and still make a legitimate profit is a question of more serious moment than to try to form an opinion as to how much more money we will spend this year than last year. There are three ways which, if combined, will allow us to meet this situation:

1. By practicing economy in every possible way.

2. By hearty co-operation among the members of this Association.

3. By advancing the selling price proportionate to the increase in cost.

Optimism, Caution and Co-operation are three great factors contributing to business success. Neglecting to incorporate either one of them in your business affairs during this period of storm and stress may mean failure, but to sell without profit is sure to bring disaster. The following exposition on "Selling at a Profit," was printed in a trade journal a few years ago and seems to be appropriate for reiteration here:

"Selling goods without profit is injurious to manufacturer, jobber, retailer and consumer.

"It destroys reputations, depreciates quality and leaves ruin and demoralization in its path.

"It is the father of deception, misrepresentation and business hypocrisy.

"It creates strife, discord, distrust and dishonesty.

"It opens the doors of bankruptcy and closes gates of opportunity.

"It deprives honest effort of reward and puts a premium upon lying inconsistency.

"Its pernicious influence forces all to a common level.

"Don't cut—stick to your prices!"

(The Dodge Idea.)

While it is the purpose of this paper to urge upon you the necessity of guarding your selling yet advantage should not be taken of a situation to advance prices on false pretexts. It will be better business judgment to be content with reasonable profit now obtained from prices which can be maintained rather than in reaction to be compelled to lower prices when normal conditions are restored. Unfairness with reference to determining prices will not only bring the sand and gravel business, as well as any other, into disrepute but will also discourage and delay construction work during a year when prospective builders are hesitating because of the uncertain conditions which prevail. Keep your prices up but be fair.

Mr. Harry E. Dennie, formerly located at Salt Lake City for the Imperial Belting Company, whose factory and general offices are in Chicago, has been promoted to western manager for his company located at 525 Market Street, San Francisco.

The Prasch Sand and Gravel Co. and C. E. Reed at Racine, Wis., merged their sand and gravel interests, and will add new machinery, crushers and other equipment to their pits. C. E. Reed is president, Leo Schenk, vice-president, secretary and treasurer.

Cost Keeping Forms for Quarries.

By Daniel J. Hauer.

Cost keeping is as essential in quar-and also for estimating on new con-rying and pit excavation as in con-tracts as well as to know from day to struction or manufacturing. No mat-day if a profit is made, instead of wait-ter what the line of business thereing to find this out when the books are should be some method of showingbalanced at the end of the month, when costs; costs for each product produced.it is too late to prevent money from This is essential both for managementbeing lost.

Daily Report of Expenses and Deliveries of DANIEL A. LEONARD QUARRY

—191—

EXPENSES				DELIVERIES	WEATHER	
				BY WAGON		
Official Salary				Tons 2" Stone		
Clerical Salary				" 1½" "		
Foreman's Salary				" ¾" "		
Quarrymen, Crusher and Drillmen				" ⅜" "		
Blacksmith Shop Salary				" Bldg. "		
Stable Man				" Cobble "		
Drivers' Salary				Dust		
Stable and Team Expenses						
Quarry Expenses				BY CAR		
Hired Teams				Tons 2" Stone		
Watchman				" 1½" "		
				" ¾" "		
				" ⅜" "		
				" Bldg. "		
				" Cobble "		
				Dust		
Profit.				Loss.		
				Tons Total.		

MATERIAL RECEIVED	REMARKS
	Signed,

Figure 1.

9

Winchester Rock & Brick Co.

DAILY COST RECORD QUARRY AND CRUSHER.

Report No. *191*

Number	Hours Wk'd	Rate	Amount Earned	Drilling	Blasting	Loading Stone	Crusher Operating	Tripping	Watching	Repairs			

Cars N. T. Qy to Crusher

Cars N. T. Stone Loaded, No. 0
" " " " No. 1
" " " " No. 2
" " " " No. 3
" " " " No. 4
" " " " No. 5

No. Dynamite used 60%
" " " 75%
" " " 80%

Exploders

Holes Blasted

Drilling

No. 1	No. Holes	No. Feet
" 2	" "	" "
" 3	" "	" "
" 4	" "	" "
" 5	" "	" "
" 6	" "	" "
" 7	" "	" "
" 8	" "	" "

Remarks:

Figure 2.

It is hoped to point out various features of cost keeping in articles from time to time, and also to show various forms that are adapted for this purpose. In this article several forms are to be illustrated and commented upon showing that expense reports cannot be considered as cost keeping forms.

In 1 is illustrated a form, the general character of which is used by a number of quarries in the country. For the purpose of listing the expenses of operating a quarry plant and the materials delivered each day this form can be commended, but this cannot be considered a cost keeping form, nor is it possible to work up daily costs from it.

This quarry sold crushed stone, small building or foundation stone and cobbles. The sales made each day or two are listed on the right hand side, both deliveries by wagons or auto trucks and also by railroad, there being a side track entering the quarry. On the left hand side is the expense column, showing office salaries as well as wages paid in the quarry and for teams, with expenses for materials and supplies. Thus the total cost of operating is shown daily, with the deliveries, but it can be seen that if less of the products are sold than are produced, or if deliveries are made from old stock, then the profit and loss spaces on the sheet mean absolutely nothing. The quantities that should appear on a cost sheet should be those of production for the day. Without such quantities it is not possible to figure either unit or total costs of the various materials.

The form in 2 is headed Daily Cost Record, but like the other form, it is not a cost sheet but rather a time sheet gotten up in much better form than the first. At this quarry only crushed rock is produced so that this form could easily be changed into a cost form by adding the record of tons of stone crushed. It will be noted that on the right hand side a record is made of stone loaded.

At this quarry there is an attempt made to show certain details of the cost and such information is kept as to the drilling and blasting, which is excellent as far as it goes, but if costs are not analyzed and the benefits derived from it noted and used, the value of

Plant No. 14

NO.	OCCUPATION	HOURS	RATE	
	Foreman			
	Boy			
	Chief Engineer			
	Engineer			
	Fireman			
	Derrick Man			
	Powderman			
	Drill Runners			
	Drill Runner Helpers			
	Blacksmith			
	Blacksmith Helpers			
	Laborers			
	Feeding			
	Breaking			
	Cleaning			
	Loading Carts			
	Stripping			
	Loading Holes			
	Repair			
	Striking Ham.			
	Single Teams			
	Stripping			
	Outside Repair Men			
	Double Teams			
	Hired Teams			
	Trucks			
	Repairman			
	Office			
	Water Coal			
	Electricity			
	Explosive			
	Royalty			
	Miscellaneous			

Figure 3.

cost keeping is almost nil.

The form shown in 3 is considered by the company using it, a cost form, but it is little more than a summary of the time book with a few additional costs. This company operates two quarries and do a large business in a New England city. It is along the general idea of the other two forms.

It would be possible to show other samples for quarries, but this is enough to illustrate the assertion previously made that many of the so-called cost keeping systems do not give the results claimed.

Delivering Gravel to Stock Pile.

The illustration herewith shows a piece of equipment added to the plant of the Chicago Sand & Gravel Co., at Joliet, Illinois. This is a belt conveyor, by which material after being washed and screened, can be delivered to stock piles instead of to the bins. This plant has a very large capacity, making an arrangement of this kind necessary.

The long belt conveyor on which the material is deposited from the screens delivers onto a shorter traveling belt conveyor on top of the bridge shown to the left of the illustration. This shorter belt is carried by trucks on a track so that it can be moved along as desired, thus depositing material over a considerable area.

The material is loaded onto cars from the stock pile by a locomotive crane equipped with a clam-shell bucket.

Conveyor of Gravel Plant, Delivering to Bins or Stock Pile as Required.

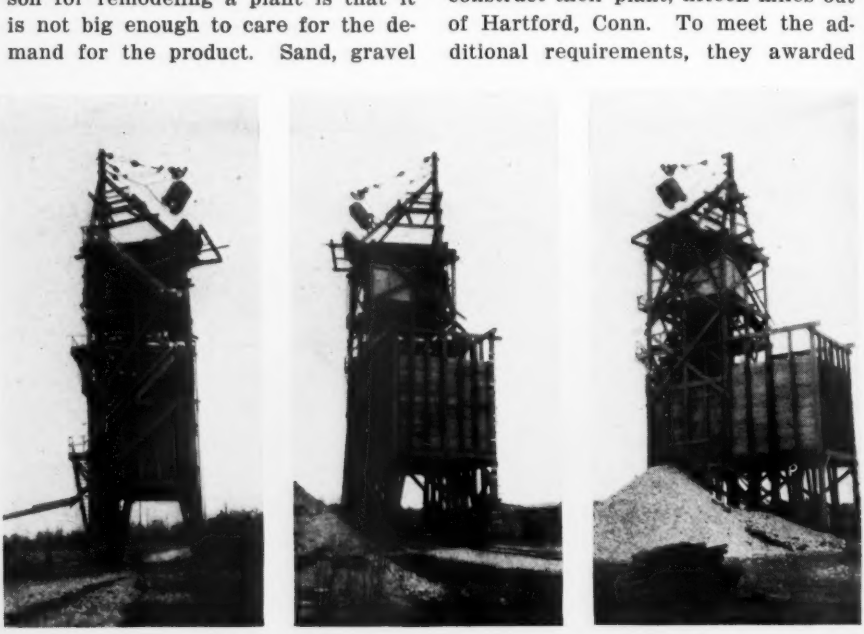
A Remodeled Plant

Perhaps the most gratifying reason for remodeling a plant is that it is not big enough to care for the demand for the product. Sand, gravel and stone are no exceptions to the rule that the supplying of standard qualities and sizes will increase the sale to a place where the plant must be enlarged.

But there is another reason also. Supplying a better grade than can commonly be obtained creates a higher standard, and the improved product must be raised still higher in quality. Starting with pit or crusher run material, there is a call for it to be washed, then screened and graded. The coarse gravel soon becomes a burden and a crusher must be put in. Who ever heard of a gravel crusher more than a comparatively few years ago?

The certainty of obtaining good materials will increase the demand and sand, gravel and stone companies feel this as soon as anyone.

Early this year the Atlas Sand, Gravel and Stone Co. decided to reconstruct their plant, fifteen miles out of Hartford, Conn. To meet the additional requirements, they awarded a contract to Sauerman Bros., of Chicago, for a dragline cableway excavator having a 600 ft. span, and operating a 1½ yard bucket with Shearer and Mayer dumping device.



Reconstructed Plant of the Atlas Sand, Gravel and Stone Co., Near Hartford, Conn.

Power for the dragline is supplied by a 90 H. P. Thomas two-speed electric hoist, working from the ground. To the screens and washers in the old plant, was added a crusher for reducing the coarse gravel and boulders to commercial sizes. As the pit has been developed the gravel contained more and more of the coarse material, and the crusher thus works up at little cost the material which would otherwise become an unwieldy pile.

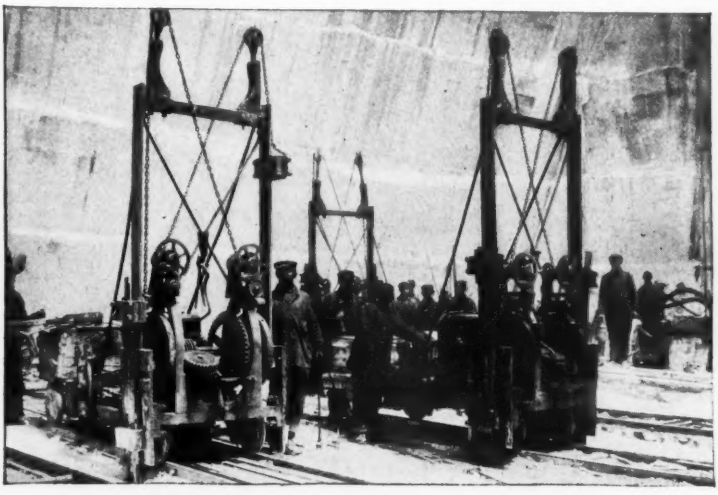
An unusual feature of this plant consists in its location on an interurban line, all of its shipments being made over that line.

Electricity in the Quarry.

Electricity has been used in some of the largest quarry workings in the world for more than two decades. And during this time the usefulness of electric motors applied to channeling out the stone, sawing it up into slabs and polishing it for shipment, has been firmly established, so much so in fact that in many quarries and quarry shops it has completely taken the place of steam and compressed air plants, the pioneer forces in quarrying.

Quarrying imposes working conditions on machinery and tools which are a good test of the stand-up qualities of all kinds of equipment. Grit, stone-dust and sand are ever present and tend to work into machine bearings and deposit on motors, generators, and engines. Drills and channeling machines must be operated in the stone dust which they raise. Tools are subject to shock and vibration in transporting and in use. In view of these severe working conditions it is interesting to study what is probably one of the oldest, largest and most completely electrified marble quarries in the world, at Proctor, Vermont.

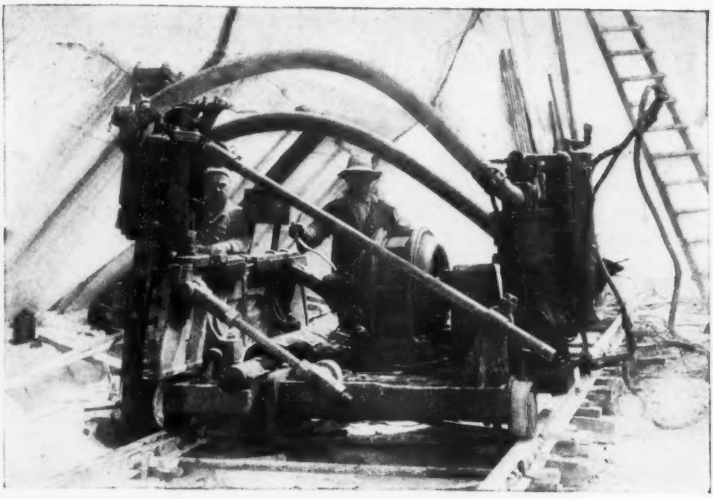
This extensive quarry includes 25,000 acres of land, employs 4,000 men, and turns out more than a million cubic feet of finished stone each year. It is owned and operated by the Vermont Marble Company. The entire process of getting out the stone, from cutting it out with electric channelers to polishing and boxing the stone for shipment, is performed with the aid of electricity. The total number of motors used is 570. They range from two to 250 horsepower, and have a total aggregate horsepower of 14,000. The electric power used on the workings is supplied by four hydro-electric generating stations, backed up by two steam generating plants usually held in reserve.



Double Lever Channelers, each driven by a 220-volt series direct current railway type motor.

The method used in getting the marble out is interesting because the work is done with electric channelers and electric-air rock drills and hand tools without blasting. More than 100 electric channeling machines are used to

General View of Vermont Marble Quarries and Yards, Proctor, Vermont.



Electric-Air Drill, driven by a 5½-h. p., 1800/900-r. p. m., 220-volt Form KT induction motor.

cut deep grooves in the marble, and the stone is split off when wedges are driven into holes drilled along the line of cleavage. This drilling is done with electric air drills. The drilling machine is connected to the electric compressor set by a hose only, the two units being mounted on separate portable bases. The rough blocks of stone are hoisted out of the quarry pits with motor operated derricks and loaded on flat cars for transport to storage yards or to the mills to be worked up into finished product.

The marble sent to the mill is made up into blocks and cylinders of various sizes. Practically all of this work is done by electric motors. Three hundred electrically driven gang saws cut the marble up into slabs of various

A Portion of One of the Polishing Rooms.

General View of Vermont Marble Quarries and Yards, Proctor, Vermont.

We Are the Pioneer Manufacturers of Gravel Washing Machinery

The first gravel washing plant was an "S-A" Plant. We developed the original gravel washing machinery which is still recognized as standard. In fact, the records will show that we actually developed the industry.

Altogether in the past fourteen years we have designed and equipped about 400 gravel washing plants. Each one of these was especially designed—each one has been a *commercial success*. We have turned down orders for a number of plants where the elements of success where lacking. We have turned failure into success for several others by re-equipping with "S-A" Machinery.

We have a strong organization of engineers—and a large plant devoted to the manufacture of the highest grade of conveying elevating, screening and transmission machinery.

It is to your interest to deal with manufacturers and not jobbers

"Ask the Man Who Owns One"

The following is an incomplete list of the newer "S-A" plants

Gravel Washing

Los Angeles Rock & Gravel Co.
Scottsville Sand & Gravel Co.
Montana Concrete Co.
Vandalia Railroad.
Standard Builders' Supply Co.
Hawarden Sand & Gravel Co.
H. D. Conkey Sand & Gravel Co.
F. A. Downs Construction Co.
Mason City Sand & Gravel Co.
Jensen & Jensen.
Virginia Sand & Gravel Co.
L. D. Burd.
Wabee Gravel Co.
Summit Sand & Gravel Co.
Geo. J. Hoffman.
Logansport Gravel Co.
Battjes Fuel & Supply Co.
Wabash Sand & Gravel Co.
Macksville Gravel Co.
Mason City Sand & Gravel Co.
Covington Sand & Gravel Co.
American Agricultural Chemical Co.
Madison Construction Co.
Windsor Sand & Gravel Co.
Atwood Davis Sand Co.
Lake County Gravel Co.
Chas. Vivian.
Vigo Washed Sand & Gravel Co.
Interstate Material Co.
H. W. Hawly.
Wabash Sand & Gravel Co.
Kingsley & Pagant.
Pueblo Bridge.
Minden Gravel Co.
C. H. Billings.
Canada Sand & Gravel Co.
C. H. Little & Co.
Beaver Sand Co.
McCraney Sand Co.
Coon River Sand Co.
Downs Construction Co.
Virginia Sand & Gravel Co.
Chicago Gravel Co.
Hoyt Mining Co.

Stone Washing

Brownell Improvement Co.
Peoples Crushed Stone Co.
U. S. Crushed Stone Co.
Big Rock Stone & Const. Co.

"S-A" Equipped Crushing Plants

A. C. Laughlin Stone Co.
France Stone Co.
General Crushed Stone Co.
National Lime & Stone Co.
Bessemer Limestone Co.
Branchton Limestone Co.
Blair Limestone Co.
Standard Lime & Stone Co.
Union Lime Co.
Elmhurst & Chicago Stone Co.
Leathem & Smith.
Greenleaf Stone Co.

We'll gladly supply the address of any of the above for reference or send names of "S-A" plants in your territory

Put your proposition up to us and we'll help you make it pay

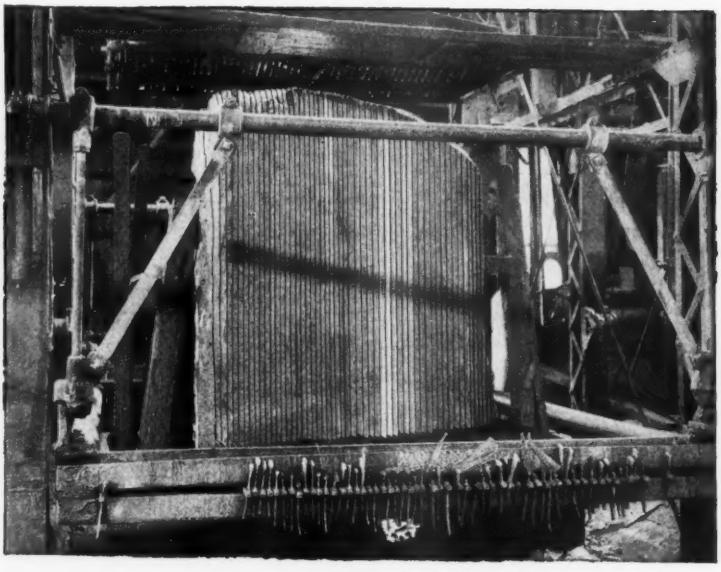
Stephens-Adamson Mfg. Co.

Aurora, Ill.

sizes and these pieces are then sent to the finishing shops where 65 electrically operated finishing beds smooth off the rough surfaces. Electrically driven finishing machines are used to impart the final polish.

The advantages gained by the quarry management in such a widespread adoption of motor drive are quite apparent to those who were working in the quarries when electricity was first adopted about 20 years ago. Flexibility is the greatest advantage. By this is meant the relative ease and speed with which the electrically operated units may be shifted about without disconnecting and re-laying lines of steam or compressed air piping. There are no leaky pipe couplings to waste power, nor excessive heat losses from steam piping and boilers when the temperature is low. Electricity is used only when the machines are in use, whereas with steam or compressed air the pressure must be kept up at all times in each of the separate steam plants, it being impractical to supply all quarries from a central steam plant.

Operation of the motor drive under such unfavorable conditions for such a long term of years has demonstrated its dependability. Engineers of the General Electric Company who installed approximately 65 per cent of the electrical equipment, revisited the the plant and inspected the motor equipment. They found that many of the motors used for 20 years on rock channelers were in good operating condition and showed practically no depreciation in operating efficiency. Enforced cessation of work on individual units has been rare, and the repair expense for the larger motor units is practically negligible.



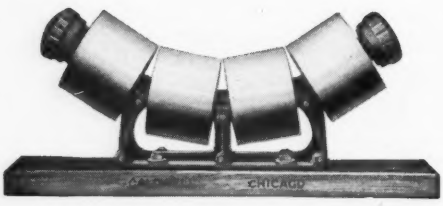
Sawing the Blocks Into Thin Slabs.

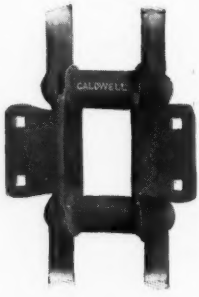
The Hersey Gravel Company has been organized at Evart, Mich., with a capital of $40,000, $27,000 paid in. The stockholders are William Reardon of Midland, president; Mr. Davy of Evart, secretary-treasurer; G. A. Glerum, Evart; Mr. Sheltrow, W. H. Allswede, Sanford. The office of the company will be at Evart.

CALDWELL MACHINERY

FOR HANDLING

Stone, Gravel, Sand





Screw and Belt Conveyors, Steel Elevator Casings and Buckets, Gears, Cut and Cast Teeth, Link Chain Belting, Shafting, Pulleys, Sprocket Wheels, Etc.

H. W. CALDWELL & SON CO.

CHICAGO

Western Ave., 17th to 18th Sts.

Ohio Company Changes Its Name.

The Interstate Stone Manufacturers' Association, formerly at Ottawa, Ohio, has changed its name to the Ohio Macadam Association, with headquarters at Columbus, O. The new name is more indicative of the character of the membership, as the association includes contractors and different binder interests. An active interest is being taken in a plan to increase the interest in farm life, and a plan is being worked out whereby a number of farm boys will be trained in stock judging, and the best of these will be sent to the Chicago Stock Show in December.

The Association will promote the National Macadam Congress to be held in Columbus, Ohio, next January, and a number of states will send delegations.

The economy and virtues of macadam roads will be discussed and the great need of good roads for everybody to promote both rural and general welfare will be presented. National leaders in the road building game will be on the program, and several prominent men in public life today will assist in making this National Macadam Congress a high spot chapter in good roads building.

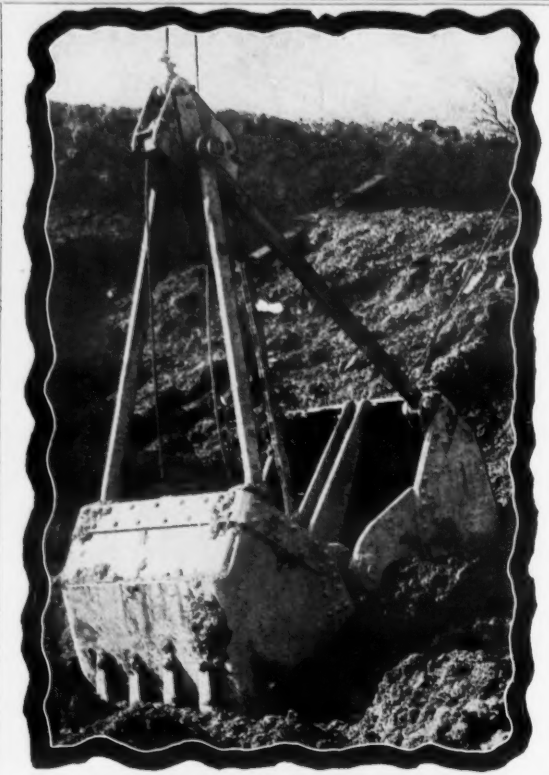
Build Pier to Handle Sand and Gravel.

Whitney Bros., Duluth Minn., have arranged to build a 500 ft. pier for handling the almost inexhaustible supply of sand, gravel and boulders along the lake shore at that point. Crushing, grinding and screening machinery will be installed on the pier, and a conveyor system will carry the materials to hoppers at the above end, to be dropped into railroad cars for shipment.

Rapid Loading

This is the way the Empire Limestone Co., of Buffalo, N. Y., load their trucks for city delivery. The same outfit unloads cars, often directly into the trucks. The reserve piles insure prompt delivery of any size or quantity.

Loading Trucks at Yards of Empire Limestone Co., Buffalo, N. Y.



Blaw Buckets save 70% in cable maintenance costs alone

Greater Digging Power

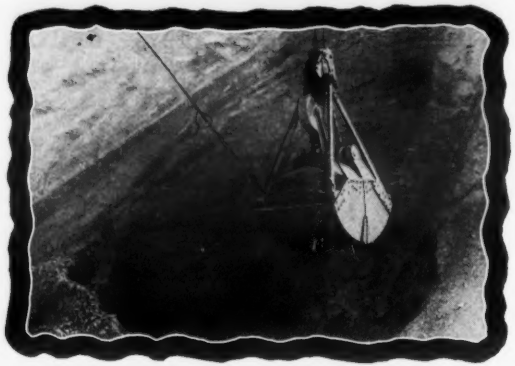
The Blaw Bucket has *greater digging power* and fills itself better with the material it is handling than any other bucket on the market. Simple, straight line reeving, *no S-Bends to wear out the cable,* make the Blaw Bucket easy on cable and fast in action.

Blaw Buckets

are built entirely of steel for hard continuous service. We are prepared to make immediate delivery direct from stock.

Write for a copy of the Blaw Bucket Book. Complete and authoritative.

BLAW STEEL CONSTRUCTION CO.
Suite 605, Farmers Bank Bldg., PITTSBURGH, PA.



Blaw Buckets are the fastest operating buckets on the market

A Big Blast.

Ten tons of dynamite, placed in thirteen holes 165 feet deep, loosened about 140,000 tons of limestone in the quarry of the American Lime and Stone Company at Pemberton, Pa., a few weeks ago.

Drilling the holes for this giant blast required three months' time, while placing the ten tons of dynamite required only six hours. The mass of limestone, which will be used in the mills for fluxing, will keep the quarry in full operation for nearly six months.

Unusual precautions are taken for the safety of property and lives during the preparation of a blast of this character. All the tracks in the quarry are torn up and all portable equipment moved far back out of range of the possible showers of rock when the shot is made. Messengers are sent out along every highway to warn traffic until the blast is over. Special arrangements made with the Pensylvania Railroad permitted flagging all trains five miles each side of the quarry until the blast was over, and the track was carefully inspected before traffic proceeded. Occasionally stray rocks get loose and might cause damage, but in the main the precautions taken prevent any loss of life or property.

Sandboat Working at Wellsburg, West Virginia.

A sand and gravel boat of the Armstrong Sand and Gravel Co. is recovering materials from the Ohio River for use in sewer work and road building near that city.

Rail Lines Planned to Aid Quarries.

The B. & O. Railroad is reported to be planning lines to Bunker Hill, W. Va., to handle the output of the quarries in that vicinity, as well as to aid in shipping the fruit crop.

A Plant for Handling Gravel

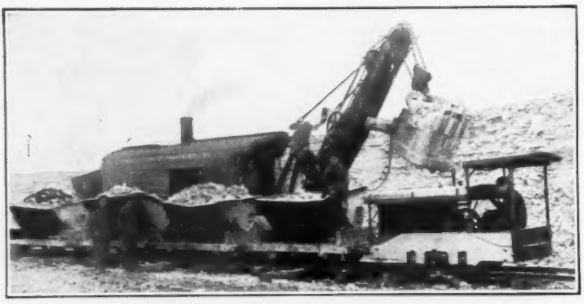
Burt Bros., Contractors, Los Angeles, Cal., have found it economical to erect this gravel handling plant in connection with their concrete pipe contract at Henrietta, Cal. Gravel by the carload is dumped into pits at the foot of the incline and a dragline, operated by one man, elevates the material into bunkers over the mixing plant.

Gravel Handling Plant of Concrete Pipe Department of Bent Bros., Los Angeles, Cal.

Hauled Gravel in Winter.

The city of Cadillac saved $1,180 by hauling gravel on sleds during the winter months. Larger loads were possible than with wagons, and labor and teams were easier to obtain.

The County Board of Hurley, Wis., have purchased a three-ton auto truck to be used in road construction and maintenance.



This Plymouth Replaced Steam Engine in Herzog Quarries

"Cuts Down Our Costs In Stone Quarry" —Says Bert Herzog

Steam, horses or other power-hauling systems are more expensive to buy, install and operate than the Plymouth Friction-Drive Gasoline Locomotive, according to John Herzog & Son of Patterson and Forest, Ohio.

The Plymouth
Friction-Drive Gasoline Locomotive
Cuts Haulage Costs One Half

It costs less to buy, less to install, less to operate and less to maintain. It takes heavier loads up-grade, uses full power of motor in high or low speed, and moves quicker, without jerk or jar.

Mr. Herzog Proves All This

"The Plymouth, which replaced the steam dinky, costs us considerable less for installation, and also represents a decided saving in operation cost," says Mr. Herzog. "The Plymouth is far cheaper to operate than horse, steam or other power-driven systems because we save in fuel, up-keep and every other point."

THIS BOOK TELLS It gives the complete story of this and many other installations, cost data and information regarding haulage problems similar to your own.

A COPY FOR THE ASKING

The J. D. Fate Co. 206 Riggs Avenue PLYMOUTH, OHIO

Reducing Misfire Costs.

Many times on a rock job one sees the shovel hung up and doing nothing. On investigation it is found that they have encountered some tight bottom which the shot failed to pull. This means a delay of an hour or more while the obstruction is redrilled and reblasted before the shovel can be advanced and digging resumed. Again a delay of several days may be caused by the discovery that there are missed holes and unexploded powder ahead—naturally the shovel crew is reluctant or refuses to proceed until the danger is removed. Oftentimes the material has to be carefully mucked by hand and all this time the shovel is lying idle. Obviously in order to get the best out of a shovel or dredge continuous, steady operation must be maintained. Such delays are very expensive and if they occur frequently may even disrupt the whole organization. It is not uncommon to see a dipper dredge bring up unexploded charges. Occasionally these charges explode when hit by the dipper teeth, causing considerable damage. Dig deeper holes to bring bottom. Use more care in loading and in testing caps.

It has been proven by actual experience and tests by U. S. Bureau of Mines that it requires more and stronger explosives for submarine rock excavation than in open cut work. To a great extent delays and danger from above causes can be avoided by the proper selection and care in loading of explosives. Frozen explosives are less sensitive and efficient than when thawed.

In order to get the maximum out of any explosive it is well to use strong detonators.

For rock work before a steam shovel if work is wet it is best to use a low freezing gelatin from 40 per cent to 60 per cent strength, depending on the character of the material. Present prices of glycerine being high, contractors are finding that good results can be obtained by using lower grade explosives where higher grades were formerly thought necessary. If work is dry a low freezing dynamite can be used. In tight, hard bottom, the gelatin is best suited because in addition to the no-thawing advantage, it combines density with high water-resisting characteristics. Density is an advantage in that more weight of explosive can be concentrated in bottom of any given diameter of bore hole than with lighter dynamites.

For submarine rock blasting a 75 per cent strength gelatin dynamite is best adapted. Nothing weaker than a No. 8 Electric Blasting Cap should be used with any gelatin. There is a lot of potential energy in a gelatin and in order to release it a No. 8 detonator is necessary.

Stick to the well proven standard explosives for best results. Promiscuous trying out of unproven brands may cause a lot of trouble and expense. It is not difficult to reduce the powder cost per ton or yard of material in almost any operation. The charge per hole can be arbitrarily reduced a pound or two with seemingly equal results; but watch out! The shovel cost and secondary drilling cost may jump up, more than wiping out the apparent saving.

J. A. RIDGWAY
Woolworth Bldg.
NEW YORK
Telephone:
Barclay 6398
New York Sales Agent for the
"Plymouth" Gasoline Industrial Locomotive
MADE BY THE
J. D. FATE CO

LINK-BELT

Elevators and Conveyors

For Sand, Gravel, Stone, Etc.

YOU can entrust your requirements for sand, stone and gravel handling plants to our experienced engineers and be assured of a practical, efficient plant. Whether you plan a complete new plant, or require additional equipment, we shall give your conditions our best study.

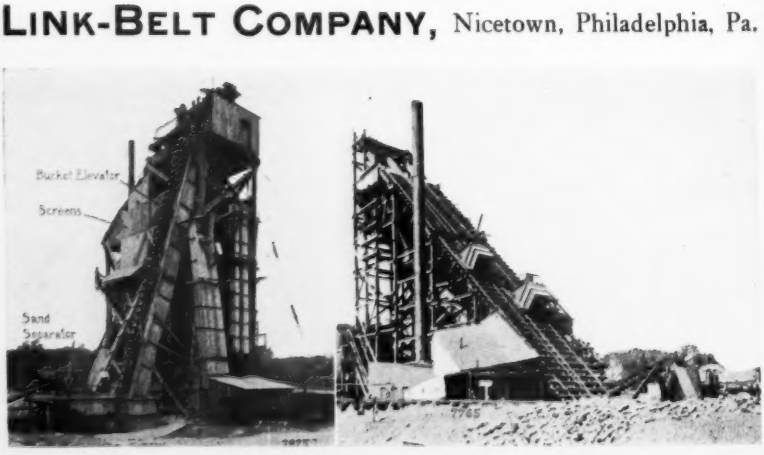
Communicate with us at once if you are contemplating the installation of new machinery or making alterations in your present plant this Spring. Owing to the unusual condition of business in the machinery field, shipments will be facilitated if orders are placed early. Act today.

Link-Belt Equipment includes:

Gravel Plants *Stone Plants* *Sand Plants* *Bucket Elevators and Conveyors*
Washeries *Screens* *Locomotive Cranes* *Grab Buckets*
Car Unloaders *Wagon Loaders* *Link-Belt and Sprocket Wheels, etc.*

Let us figure on your requirements. Our experienced engineers are at your service. Write for Book No. 213.

LINK-BELT COMPANY, Nicetown, Philadelphia, Pa.



P-7

New Companies.

Monarch Quarries Co., Bloomington, Indiana. Directors, James H. Nolan, John K. Nolan, Harry A. Nolan.

Martinsville Gravel Co., Martinsville, Ind. Directors, H. H. Hicks, W. C. Merideth and M. M. Merideth.

Commerial Sand and Supply Co., Hutchinson, Kans. Incorporators, C. W. Stamey, Charles Mackey and A. E. Atkinson.

Neversink Sand and Stone Co., Reading, Pa., partnership composed of Thomas R. Bucks and Samuel Simon.

The Moline Consumers Co., Portland, Ore., represent the consolidation of the Moline Sand Co. and the Moline Consumers Co. James P. Pearson is president and Charles C. Lohtein secretary.

The Randolph Sand and Gravel Co. has been incorporated to take out sand and gravel at Randolph, Minn. Dr. F. D. Kendrick is president, H. C. Struchen, vice-president and general manager, and D. H. Bradley, secretary-treasurer.

Rock Creek Sand and Gravel Co., Ardmore, Okla., has been incorporated for $25.000 by James Barron, Edward Galt and Wirt Franklin.

News of the Companies.

A company composed of George Glerum, V. R. Davy and several others have bought 200 acres near Hersey, Lowa and expect to erect a big plant for the production of commercial sand and gravel.

Some $40,000 was expended by the Ottawa Sand and Gravel Co., Ottawa, Ill., to bring their plant up to date. The company reports a greater demand than they are able to supply.

The Petoskey Crushed Stone Co., Petoskey, Mich., expects to ship 150,000 tons of crushed rock to the Newago Cement Co. this season.

L. A. Thorsen, known about Crookston, Minn., as the "Gravel King," has closed out all his other business and will devote his time entirely to his gravel interests.

The Greenville Gravel Co., Greenville, Ind., operating eight plants in Ohio, Indiana and Michigan, has increased its capital stock from $250,000 to $750,000.

The Portsmouth Sand and Gravel Co., Portsmouth, Ohio, will dredge sand and gravel from the Ohio and Scioto Rivers.

The A. W. Lehrke & Co. sand and gravel plant near Rockford, Ill., has been sold to the Conkey Coal Co. of Mendota, Ill. The Conkey Co. owns several plants of this character.

The Mackinaw Sand and Gravel Co. of Peoria have increased their capacity by putting in a belt conveyor capable of handling 20,000 tons of material a day.

Fifty thousand dollars will be spent for machinery for the Macksville Gravel Co., Rockville, Ind. Fifty acres have been added to their plant.

The Ottawa Stone and Sand Co., Ottawa, Ill., has increased its holdings some 140 acres, the greater part being gravel land. This property includes "Buffalo Rock," a noted landmark on the Illinois River, as well as coal, sand, clay and gravel lands.

Traylor Crushing Rolls.

Bulletin R-1, of the Traylor Engineering and Manufacturing Co., Allentown, Pa., contains descriptions of several types of Crushing Rolls and Machinery. The design of these are scientifically correct, as well as practically, and especial attention has been paid to provide equal wear on the rolls and crushing surfaces. The methods for securing these results are shown in the bulletin, as well as the various machines with their capacities, etc.

Hill Clutch Equipment.

Power transmission and distribution requires careful installation, especially with reference to clutches, bearings, etc. The Hill Clutch Co., Cleveland, Ohio, are specialists in this kind of work, and will send our readers, free on request, their bulletins showing typical installations, suggestions and other information on this subject.

Transmits 40% more power at less cost than any fabric belt

Made for Transmission, Conveying and Elevating Duty under Wet or Dry Conditions

BETTER AND MORE ECONOMICAL THAN FABRIC OR LEATHER FOR PITS OR QUARRIES

Young Inner Duck Belting Co.

416 W. Grand Avenue CHICAGO, ILL.

We're Ready

to meet your requirements in full for high grade

Track Equipment

A complete line of frogs, switches, crossings, crossovers, switch stands, etc.

Ask for Catalog 103

The CINCINNATI FROG & SWITCH COMPANY
MANUFACTURERS OF
TRACK EQUIPMENT FOR
STEAM AND ELECTRIC RAILROADS
MINES AND MILLS
CINCINNATI, O.

Manganese Steel Pumps and Wearing Parts.

The quality demanded in sand and gravel can only be obtained by handling, washing, screening and grading the products. Water must be used liberally, and this in connection with the sand and gravel is apt to abrade or wear the parts of pumps, cutter heads, etc., unless these parts are of a material to resist this action.

Manganese steel, noted for its resistance to wear, is used by the American Manganese Steel Co., McCormick Building, Chicago, Ill., for their sand and gravel pumps as well as for the wearing parts of pump dredges, etc. A booklet shows these pumps and some of the parts made of this material.

Rock Crushing Equipment

The Allis-Chalmers Manufacturing Company of Milwaukee, manufacturing as it does such an extensive line of machinery and equipment, has its catalogues divided up into a number of sections, so that only such sections as may interest an inquirer need be sent out. The various sections are assembled in a heavy cover.

Some of these sections are of special importance and interest to readers of Pit and Quarry, notably Bulletin No. 1411 on Rock Crushing Plants, and Bulletin No. 1415 on the Gates Rock and Ore Breaker.

This latter is devoted entirely to illustrating and describing the various parts of the Gates breaker. The other bulletin is of especial interest because of the fact that it includes a large number of sectional views of crushing plants. These views are made from actual plants which this company has designed for various parts of the country, and cover a wide range, from a small plant, designed for a small Wisconsin town, up to plants of large capacity for producing railroad ballast, or crushing stone for the general contracting field.

Either one or both of these bulletins will be sent to readers of Pit and Quarry on request.

Centrifugal Sand and Gravel Pumps.

Heavy duty equipment is required for handling sand and gravel, dredging, etc., as the equipment may suddenly meet the hardest kind of work. Unless it is suitable for this, breakdowns are certain to occur.

Messrs. Hetherington & Berner, Indianapolis, Ind., show in their circular A-10 a number of styles of pumps adapted for handling sand and gravel economically and in whatever quantities required. This catalog also shows in detail the various parts of sand and dredging pumps and gives directions for erecting and running, pouring, etc. The various styles and sizes of pumps are described in detail, with sizes, capacities and prices, and the circular is of value to anyone anticipating using equipment of this character.

Haulage Costs With Duplex Trucks.

Few contractors and dealers in sand, gravel and stone for construction have their choice of road conditions. Too often they must haul over the worst roads, or where no roads exist at all. In such places the ordinary rear-wheel driver truck is at a disadvantage, while the Duplex truck made by the Duplex Truck Co., Lansing, Mich., is designed to travel wherever one wheel has traction. The Duplex truck drives on all four wheels, a plan which enables it to travel where others would fail, and yet on good roads it holds its own with the best of them.

A catalog just off the press shows the Duplex trauck in detail, and, as it will be sent to our readers on request, will show how it can be used to advantage in their business.

Schaffer Poidometers.

Have you ever wanted to know accurately how much your machines were producing, or to feed the materials at an exact rate? It requires good judgment to know just how much to open a gate or valve to let the required amount through, but it is interesting to know that the Schaffer Poidometer does this work automaticaly.

The Schaffer Poidometer can be used for practically any materials which can be fed through a hopper, and the control which the device has over the hopper gate determines the rate of flow of the materials. We cannot in this space describe this device fully, but it is shown in Bulletin No. 5 issued by the Schaffer Engineering and Equipment Co., Tiffin, Ohio. Interested readers may obtain the bulletin on request.

54 holes, average depth 92 ft., fired by means of Cordeau-Bickford Detonating Fuse

CORDEAU-BICKFORD

An Instantaneous Detonating Fuse for

SAFETY and EFFICIENCY

Particularly adapted to well drill shooting where large columns of explosives are fired, where it is desirable to break the charge in the drill hole, or where a great many holes are to be fired at one time.

Cordeau is run from the top to the bottom of the drill hole in contact with the explosive charge—one continuous detonator.

RESULTS: Complete detonation, quicker detonation, greater shattering effect, lower secondary costs, substitutes a detonator which is insensitive to shock and friction in place of the electric caps.

Write for Cordeau Booklet and Deep Well Blasting

THE ENSIGN-BICKFORD COMPANY

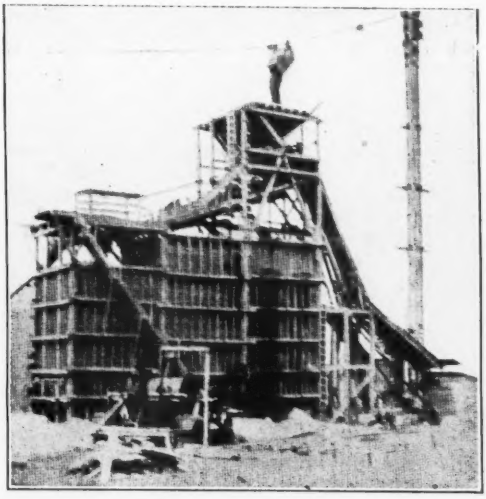
Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

This is a

"DULL" PLANT

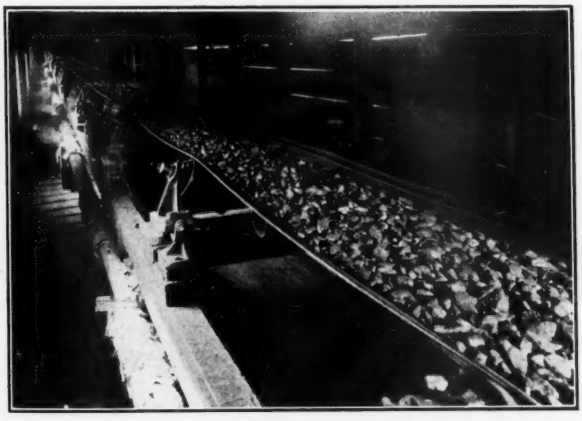


The Bucket is especially designed for use in sand and gravel plants, It's one of the famous DULL Rear Dumping Type. Every trip brings a capacity load. That's one detail.

The Screens are the celebrated DULL Inclined Conical Type. These screens produce, at the lowest figure possible, the highest quality, best-profit returning, sand and gravel.

The General Equipment and Layout of the plant illustrates Raymond W. Dull's **mastery of detail,** a quality that has made this plant and other DULL plants highly successful.

THE RAYMOND W. DULL CO., 111 W. Washington St., CHICAGO



For Driving and Conveying

Victor-Balata Belt

White Seal Belt

Ampere Canvas Belt

Write for Recommendations, Samples and Prices

Victor-Balata & Textile Belting Co.

CHICAGO
172 N. Franklin St.

FACTORIES
EASTON, PA.

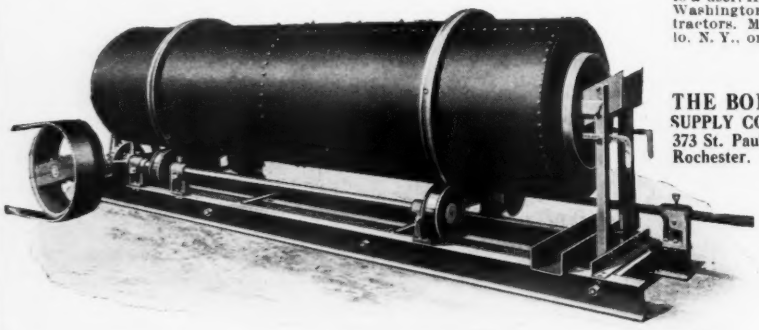
BROOKLYN, N. Y.
465 Kent Ave.

The Rapid Sand and Gravel Washer

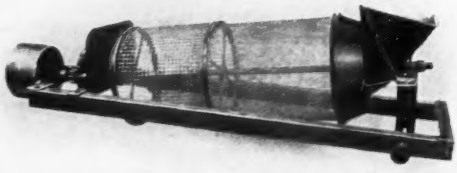
You can convert dirty sand and gravel unto the very finest quality and material for concrete in record time and at rock bottom cost, with a RAPID Sand and Gravel Washer. A *scouring* motion is the answer. The final step in the operation is a thorough rinsing in fresh clean water.

Despite its thoroughness, the process is very rapid. These properties are *permanent* in this machine; it is very sturdily constructed, cylinder of heavy steel, riveted. It is made in four capacities.

If you care to know what the RAPID can really do, write to a user. Hembt & Washington, Contractors, Monticello, N. Y., or to us.



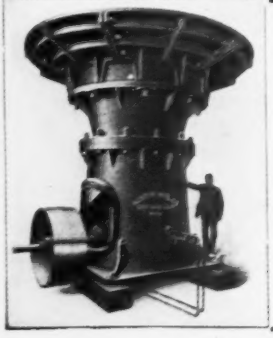
THE BONNEY SUPPLY CO., Inc.
373 St. Paul Street
Rochester, N. Y



MATERIAL SCREENS

If you have material to screen, it will pay you to learn more about S. & S. Screens, write, giving us an idea of your requirements and we will do the rest.

CEMENT TILE MACHINERY CO. - - 250 Rath St., Waterloo, Iowa



AUSTIN GYRATORY CRUSHERS

Made in Eight Sizes
From 50 to 5,000 Tons
daily capacities.

AUSTIN MANUFACTURING CO.
CHICAGO

An Operator Worrying Over a Problem

DON'T WORRY!

—PIT & QUARRY Research Department is the "Clearing House" for *solutions and information.*

If Any Problem Confronts You

If you are looking for a *solution*, or *information*, or *equipment*, new or used, not advertised in PIT & QUARRY—

Write your troubles below

Address to

PIT & QUARRY, *Research Department*
527 South La Salle Street CHICAGO, ILLINOIS

_____ _____ 1917

PIT & QUARRY, *Research Department*
Gentlemen:

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Yours truly,

Name _____

Address _____

KEEP UP WITH YOUR MARKET

You can't whittle a peg to fit a hole *you've never measured!*

Neither can you produce sand, gravel or crushed stone as aggregate for the *Concrete Industry* if you *don't know* exactly what it needs. * * * The standards for aggregates are always changing. To get a *bigger market*—get a *bigger knowledge.* The Concrete Industry is growing—its demands for sand, gravel and crushed stone are increasing. * * * Is *your output* increasing?

THE CEMENT ERA is the "Panorama of Progress" in the concrete industry. It will show you *bigger opportunities* for *bigger profits.*

Below are listed concrete products that you can profitably manufacture with your materials as a side line, especially as a winter activity. Check and sign the blank below, and, in addition to THE CEMENT ERA, we will send you other miscellaneous literature pertaining to the lines marked.

THE CEMENT ERA 1917
538 South Clark Street, Chicago

I want you to enter my subscription to THE CEMENT ERA for one year, and until forbid, for which I agree to pay at the rate of $1.50 per year upon receipt of bill.

Individual Name.....

Name of Company.....

Address.....

Business .....

....Silo Staves
....Sectional Culverts
....Building Blocks
....Ornamental Concrete Produets
....Fence Posts
....Sewer Pipe
....Cement Bricks
....Water Tanks
....Columns and Capitals
....Drain Tile
....Burial Vaults
....Roofing Tile
....Sills and Trimmings

Long Life and Efficient Service are Characteristics of the

WILLIAMS BUCKETS

because they are built of steel on designs which embody the right mechanical principle.

Simple in construction; bearings, few and extra large; all sheaves bronze bushed; cables perfectly guarded; alignment of sheaves exact at all times; scoops heavily reinforced and so constructed that there is absolutely no side movement; powerful and speedy closing arrangements.

— These are a few of the features that help to make our repair part business so small.

JULIUS H. SCHMIDT, Pres.
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PLANT PHONES
WILLARD 438 R, Glendale 473

ATTACH E. BEAM, Ltd. Mgr. for France & E.
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OFFICE PHONES
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THE DIAMOND SAND & GRAVEL CO.
BEDFORD, OHIO

SAND—
CONCRETE
SIDE WALKS
PLASTERING
PAVEMENTS

GRAVEL—
CONCRETE
SIDE WALKS
BALLAST
ROOFING

September 26th, 1916

Mr. Louis McLouth,
Chicago, Ill.

Dear Sir:-

Referring to your inquiry as to our success with the Williams Clam-Shell Bucket, wish to say that we have used five different makes of buckets, but none of them, except the Williams, lasted a season.

Some of them would dig as good as the Williams, but they would not stand up, as at times we pick up rocks or chunks of gravel that weigh from 1 to 10 tons, which either broke a hinge or bent the shell.

We also dig gravel out of the water, and the bucket doing this work is 3 years old and lifting this material 50 feet out of the water it does not lose a pound.

The above will show you what we think of the Williams Bucket, and we will continue to use them until we know of something better.

Yours very truly,

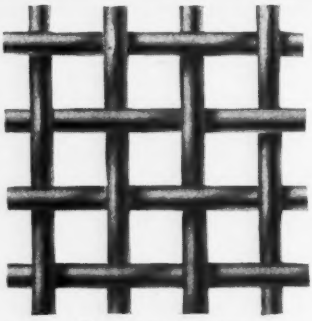
The Diamond Sand & Gravel Co.

Fred J. Schmidt

Built in Types and Sizes for Every Purpose
Catalog by Return Mail on Request

THE G. H. WILLIAMS CO.

General Office and Works, ERIE, PA.



2½ Mesh; 105 Wire

CLEVELAND DOUBLE-CRIMPED WIRE CLOTH

Renowned for its Uniformity, its Superior weave, its Durability.
Especially adapted for SAND and GRAVEL Screens.
A large stock of the various meshes always on hand.

Prices right—Catalog on request

THE CLEVELAND WIRE CLOTH & MFG. CO.
3573-81 E. 78th STREET, CLEVELAND, OHIO

AIR COMPRESSORS

All makes, types and sizes, steam and power driven and for various pressures, guaranteed condition. Some are factory repaired. **Twenty years' experience with compressed air apparatus at your command.** Send me your inquiries.
George S. Githens, 6 Beacon Street, Boston, Mass.

GRATZ B. STRICKLER

Colorado Building Washington, D. C.
CONSULTING ENGINEER

Difficult sand and gravel washing problems a specialty. Complete plans suited to each particular case. No connection with any equipment concern or builder.

Operating as Well as Designing Experience

PERFORATED METALS and SCREENS OF ALL KINDS

MATERIAL IN STOCK
PROMPT SHIPMENT

Chicago Perforating Co
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

WANTED

Double Truck Link Belt or Browning 20-ton Locomotive Crane with about a 50-foot boom. Address, T. S., care Pit and Quarry, 529 S. LaSalle St., Chicago.

Perforated Metal Screens
FOR STONE, SAND, GRAVEL, ETC.

Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints

Elevator Buckets
in all styles and sizes

HENDRICK MFG CO., 39 Dundaff Street CARBONDALE, PA.

WHATEVER YOU NEED IN PERFORATED METALS

There is no branch of the sand, gravel and crushed stone industry for which we cannot furnish the highest quality of perforated metals and screens at rock bottom cost and immediate deliveries.

NORTMANN-DUFFKE FDRY. CO., Milwaukee, Wis.

PROMPT

DELIVERY

Thomas Hoists

Electric, Steam and Gasoline

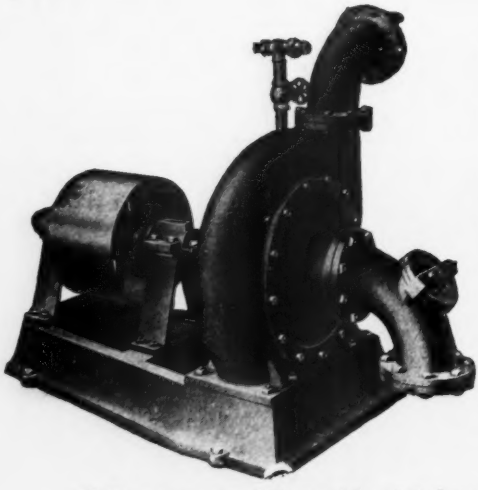
Incline Railway Hoists
Dragline Hoists
Builders' Hoists

Two Speed Hoists for
Slack Line Cableway Service
Clam Shell Derrick Hoists

In Thomas Hoists are embodied the results of 20 years' experience devoted to exclusive manufacture of Hoists. We make a hoist for every class of service and have built our reputation on **Quality.** Write for catalog.

Manufactured by **Thomas Elevator Co.** 34 S. Hoyne Ave. CHICAGO, ILL.

BRANCH OFFICE: 126 Pine St., SAN FRANCISCO, CAL.
310 W. 65th St., NEW YORK CITY



For handling sand, gravel, and other solids in suspension at a minimum cost, use

Erie Sand-Gravel Dredging Pumps

Small sizes as well as largest ones are designed to give maximum output and greatest wear for a given weight.

Tell us your conditions giving total vertical lift with length of pipe line and ask for Bulletin P-30

ERIE PUMP AND ENGINE WORKS

Formerly of ERIE, PA. MEDINA, N. Y.

ECONOMICAL EXCAVATING

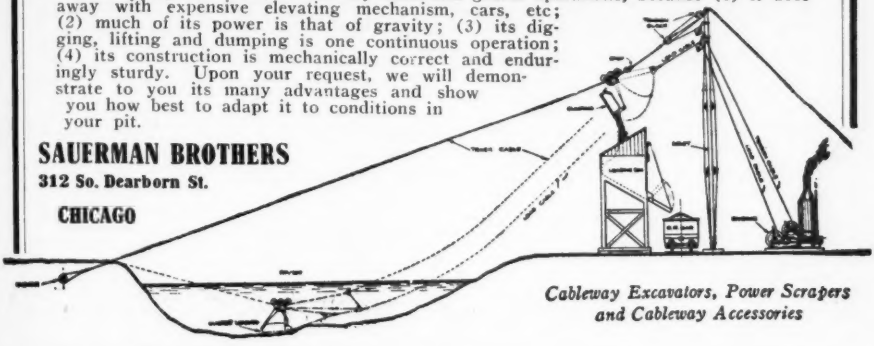
of Sand and Gravel

is best accomplished with

SHEARER & MAYER DRAGLINE CABLEWAYS

Not least among the advantages of this outfit, is its adaptability to almost any conditions. Six years of successful operation have established it as a machine of high economy in underwater or dry sand and gravel operations, because (1) it does away with expensive elevating mechanism, cars, etc; (2) much of its power is that of gravity; (3) its digging, lifting and dumping is one continuous operation; (4) its construction is mechanically correct and enduringly sturdy. Upon your request, we will demonstrate to you its many advantages and show you how best to adapt it to conditions in your pit.

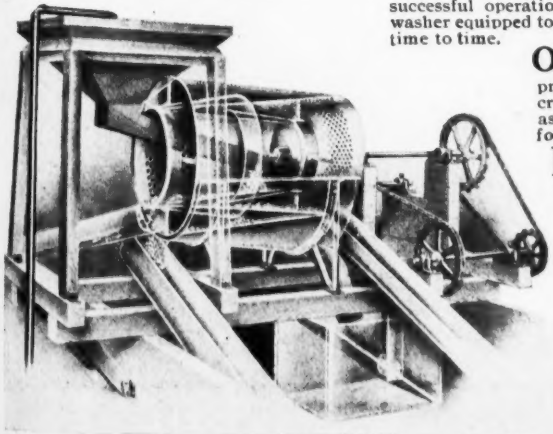
SAUERMAN BROTHERS
312 So. Dearborn St.
CHICAGO



Cableway Excavators, Power Scrapers and Cableway Accessories

SMALLER

—initial outlay
—operating cost
—space required
—expense for auxiliary machinery



"Nest-O-Cone" Equipment

The "Nest-O-Cone" Sand and Gravel Washer is marketed "by request"—in answer to a call to benefit the trade with money-saving, space-saving, equipment-saving, better product machine—though it was first made for private use. The

"Nest-O-Cone" Sand and Gravel Washer

is "different" in these respects; "Nested" screens economize space; the larger-perforated screens having the small surface; the output is uniform; does away with the necessity of high bins, large space, long shaftings, numerous sprokets and high-powered drive. Now in successful operation in large and small plants. Our washer equipped to start with. It can be added to from time to time.

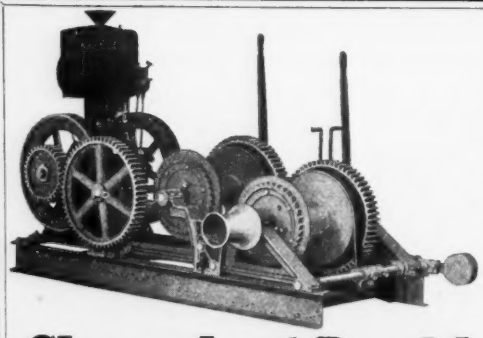
OPPORTUNITY

presents itself in this machine for concrete products manufacturers as well as the sand and gravel man. Write for particulars.

Biesanz Stone Co.

Mfgrs. of "Nest-O-Cone" Gravel Plant Equipment
WINONA, MINN.

"Nest-O-Cone" means Nested-Frusto-Conical Screens which we Patented June 15, 1915. Suitable for plants of any capacity. Plants designed to fit local conditions.



STRIPPING

in the most economical way is accomplished with the light weight self-contained

Cloverleaf Double Drum Hoist

GASOLINE or ELECTRIC POWER

Outfit operated with 2 men will easily save from 5 to 6 teams and drivers. Saves you moving your heavy excavating machinery, when they ought to be digging products.

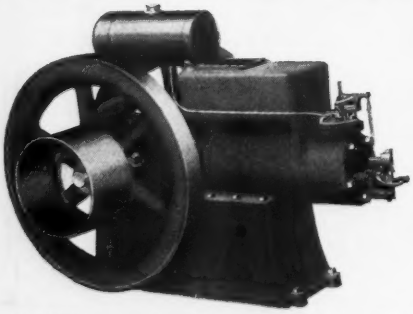
Operation Expense at Minimum *Write for Catalogue*

CLOVERLEAF MACHINE CO.

SOUTH BEND **INDIANA**

Economical Power

DYNOIL ENGINES



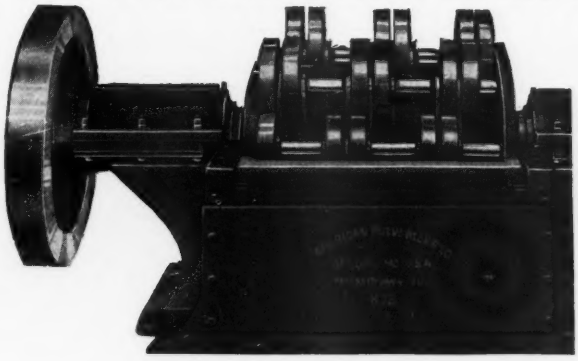
No Carbureter
No Magneto
No Batteries
No Wires
No Gasoline

BUT one simple operation is necessary before starting a DYNOIL ENGINE—just turn on the oil and crank—Starts and runs on Kerosene or other cheap oils. It is not affected by rain, cold or snow. Here is just the engine for use where not possible to fully protect from the weather. Sizes, 2½, 5 and 7 H. P. Every engine is backed by our "Golden Rule" guarantee. Write us for Booklet.

BURNOIL ENGINE CO. 1010 High Street SOUTH BEND, IND.

TWICE THE POWER TRANSMITTED BY THE BELT!

Built Stronger, Lasts Longer



"The Ring is the 'Why'"

All crushing and grinding parts are of Manganese Steel. Chilled iron liners 1¾ inches thick. Shafts, 5 inches diameter. Discs removed from grinding room of machine. SPEED, 600 R. P. M. Two years' operation without one penny for repairs is one company's record.

For Pulverizing Sandstone, Gypsum, Shale, Slate, Slag, Glass Cullet, Terra Cotta, Phosphate Rock, Limestone, etc. Made in six sizes. *Write for catalog and estimates.*

AMERICAN PULVERIZER CO., East St. Louis, Ill.

Crusher Plant Specials

Priced Low to Move Quick

CRUSHERS.

One—No.	10	Kennedy gyratory	$4,600.00
One—No.	8	Gates (suspended head)	3,600.00
One—No.	7½	Austin, manganese concaves	1,500.00
One—No.	7½	Kennedy, gyratory	1,400.00
One—No.	6	Austin	900.00
One—No.	5	Austin	850.00
One—No.	4	McCully (new)	750.00
One—No.	3	McCully, good condition	535.00

(All of the above are in good condition, ready to run now. Prices are F. O. B.)

CRUSHING ROLLS.

One—Set P. & M. Co. 36"x16".
One—Set Buchanan, 24"x15".

SCREENS.

Two—Revolving screens, 60"x17'.
One—Revolving screens, 40"x21'.

BELT CONVEYORS.

One—36"—100' centers.
One—25"—100' centers.

(These conveyors are complete except belts.)

NOTE—The No. 10, the No. 7½ Kennedy, and the No. 6 Austin crushers, and the two belt conveyors, can be seen at the plant of the Mississippi River Power Co., at Keokuk, Iowa.

All of the above is modern equipment, and in good condition.

Details not appearing above, furnished promptly upon request.

We respectfully solicit inquiries for power plants, pumps of all kinds, steam shovels, locomotive cranes, and electric apparatus.

If you have any surplus equipment for sale, let us sell it.

MARSH BOTHE MACHINERY CO.

975 Old Colony Bldg. Phone Harrison 2746 CHICAGO, ILL

ONE DUPLEX FRONT WHEEL PULLS 7,000 - POUND LOAD

Three wheels of a Duplex truck sank almost to the hubs in a "soft" spot on a heavy grade.

Only one front wheel could get traction on firm ground.

But the three Duplex wheels, embedded in mud, did not spin—because all the motive power was automatically thrown by the Duplex-Adler self-locking differentials to the front wheel having a "footing."

And the front wheel, alone, pulled the Duplex with its 3½-ton load out of the mud.

This is not an unusual incident.

It is an every-day experience with many Duplex drivers. They are taking their trucks through mud, sand and loam, and up grades and embankments where rear-wheel drive trucks become stalled even when unloaded.

Duplex trucks are not only hauling capacity loads but are also pulling two or three trailers with six to ten-ton burdens.

They are reducing haulage costs to the absolute lowest point.

The Duplex-Adler self-locking differential is but one of the many exclusive mechanical features of the Original Four-Wheel Drive Truck described in our 1917 catalog.

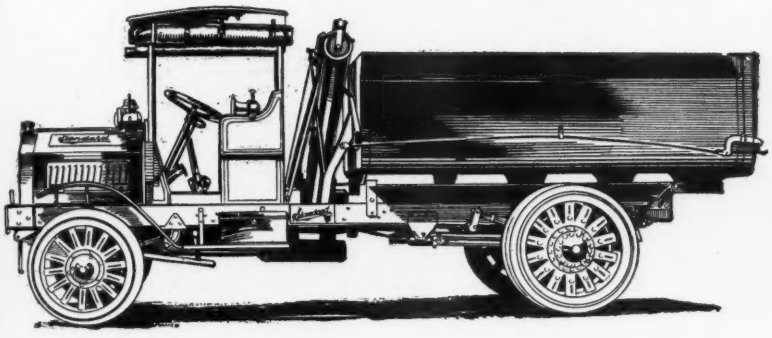
The Duplex is the coming truck. It is revolutionizing haulage work. Write today for a copy of our catalog.

Address all communications to Dept. 137

DUPLEX TRUCK COMPANY

LANSING - - - MICHIGAN

Standard
MADE IN DETROIT USA



Check Up Costs On the Standard!

PUT the Standard at work for you on a "make good" basis.

Work it hard—give it the most trying service—keep it up day after day—

—then figure up the costs—all the costs—and see the extremely low expense per ton mile!

The result will show you why the Standard ia rapidly coming to the front—why 65% of our orders are from Standard owners.

It will also prove to your satisfaction the necessity of having your truck built strong in every feature—standard in every detail. You appreciate the value of Standardized Units.

There is no question about the Standard Truck making good in your work. It is proving extremely satisfactory for many quarry and gravel pit owners. Day after day, year in and year out the Standard stays on the job doing a full day's work.

You shouldn't be satisfied with truck service less economical, less reliable than the Standard—because your business demands that you secure the most efficient delivery system.

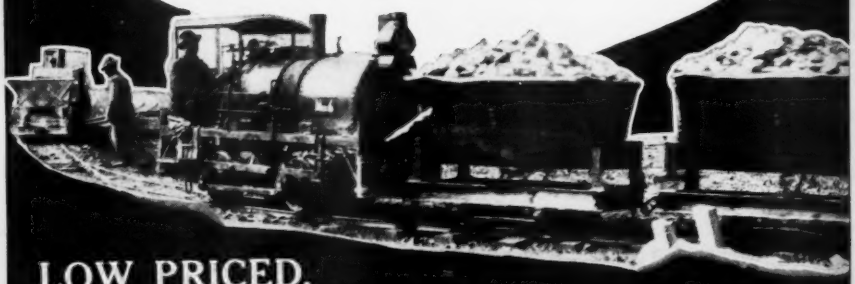
Ask us for complete information regarding the Standard line. There is a Standard Truck built for your work.

STANDARD MOTOR TRUCK COMPANY

DETROIT, MICHIGAN

BELL LOCOMOTIVES

OIL BURNING
LOWEST POSSIBLE
CENTER OF GRAVITY
50% GREATER TRACTIVE
EFFORT
NO SMOKE OR SPARKS

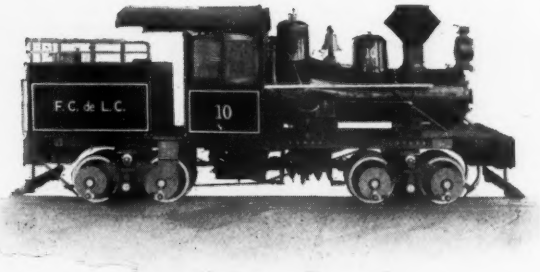


LOW PRICED.
ONE MAN OPERATED.
ALL PARTS INTERCHANGEABLE.
ONLY 15 OR 20 MINUTES
TO FIRE UP FROM COLD.

Bell Locomotives are the logical choice for pits and quarries, because they are small but powerful, simple, sturdy and inexpensive, both initially and in daily operation. They will institute for you an enormous saving in fuel alone. We back them up with a liberal guarantee.

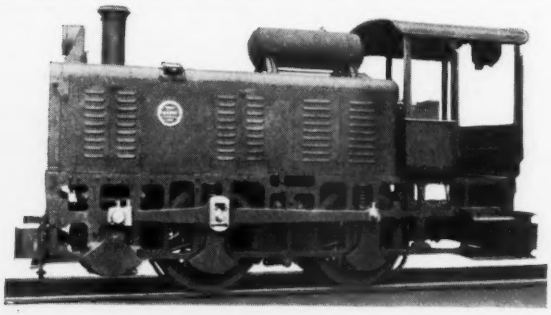
BELL LOCOMOTIVE WORKS, Inc.
30 Church Street New York, N. Y.

Heisler Geared Locomotives



Do you realize what the Heisler Geared Locomotive can do with its all steel, flexible swivel trucks and center shaft drive; short rigid wheel base, load equally distributed on all wheels; all wheel drivers, each driver having eight impulses of engine to each revolution? This means efficient service on uneven tracks, sharp curves, steep grades; saves in track construction and maintenance. Has a record of always being on the track and ready to start a load quickly. Has many decided advantages over the direct connected or gasoline locomotives for pit and quarry operations. It will pay you to investigate this locomotive for your service. Built in all sizes and gauges. Write today for all particulars.

HEISLER LOCOMOTIVE WORKS :: ERIE, PA.



Baldwin Gasoline Locomotives

are suitable for work in quarries, industrial plants and construction service.

Full particulars will be furnished on request

The Baldwin Locomotive Works

Philadelphia, Pa., U. S. A.

Second-Hand Machinery

BUCKETS

1 ¾-yard Hayward clam-shell.
1 1-yard Williams clam-shell.
1 1½-yard McMyler clam-shell.
1 1-yard Orange-Peel bucket.
1 1-yard Page drag-line Bucket.
1 2-yard Page drag-line Bucket.
1 1-yard slack-line outfit complete.

COMPRESSORS

1 Ingersoll-Rand Imperial type X-B-2, cap 2,400 ft., belt-driven.
2 Ingersoll-Rand, 2-stage, cap. 650 ft., without motors.
1 14x12 Laidlaw-Dunn-Gordon belt-driven machine.
1 Sullivan 2-stage steam-driven, cap. 550 ft.
1 Sullivan 2-stage steam-driven, cap. 1,800 ft.

CRANES

1 15-ton 4-wheel McMyler, 44 ft. boom, 1⅝-yard clam-shell bucket.
1 15-ton 4-wheel Browning, 40 ft. boom, 1¼-yard bucket.
1 15-ton 8-wheel Browning, 45 ft. boom, 1¼-yard bucket.
2 15-ton McMyler Whirlies, 14 ft. gauge, 45 ft. boom.

DRAG-LINES

1 class 14 Bucyrus, 65 ft. boom, 2½-yard bucket.
1 No. 2 Monighan, 65 ft. boom, 2½-yard bucket.
1 Page drag-line, 50 ft. boom, 1-yard bucket.

CARS

30 4-yard Western 36 in. gauge cars.
35 1½-yard Western 24 in. gauge cars.
20 12-yard Western standard-gauge cars.
30 2½-yard 36 in. gauge quarry cars.
50 80,000 lbs. capacity, gondolas.
30 60,000 lbs. capacity, gondolas.

CRUSHERS

1 No. 3 Austin.
1 No. 3 Gates.
1 No. 4 Austin.
1 No. 5 McCully.
1 No. 5 Austin.
1 No. 6 Gates, style "K," complete plant.
1 No. 6 Gates "D" crusher.
1 No. 7½ Austin, complete plant.
1 No. 12 Gates.
2 18x36 Jaw Crushers.

HOISTING ENGINES

2 3-drum 8¼x10, with or without boilers.
2 7x10 D. C. D. D. hoists.
1 6¼x18 D. C. D. D. hoist with boiler.

LOCOMOTIVES

2 10x16 36 in. gauge dinkies, just through shop.
3 9x14 36 in. gauge, just overhauled.
1 7x12 24 in. gauge, almost new.
1 10x18 standard-gauge dinkies, fine.
2 19x24 6-wheel 50-ton switcher.
1 20x28 10-wheeler, good as new.
6 18x24 Moguls, first-class.

STEAM SHOVELS

1 No. 1 Thew Traction Shovel, 1-¼-yard, first-class.
1 No. 0 Thew Shovel, first-class.
1 No. 2 Thew, on railroad trucks.
1 Model "41" Marion st. gg. trucks.
1 Model "60" Marion, 2½ yard dipper.
1 Model "61"Marion, extra-high boom.
1 Model "250" stripping shovel.
1 70-ton Bucyrus, first-class.

RAIL

200 tons 40 lbs. good relayers.
1,200 tons 56 lbs., good relayers.
1,000 tons 60 lbs., good relayers.
1,000 tons 70 lbs., good relayers.

Machinery Warehouse & Sales Co.

Successors to Geo. C. Marsh Co.

745 Old Colony Bldg. Chicago

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A testimonial from one of our satisfied customers

THE PRICE SAND COMPANY
TULSA, OKLA.

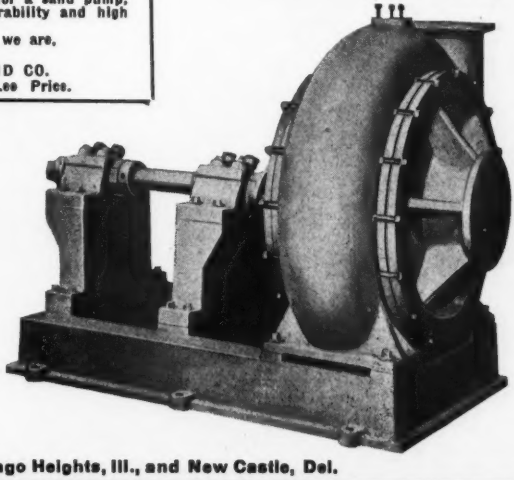
March 8, 1917.

American Manganese Steel Co.,
Chicago, Illinois.

Gentlemen:—
Your letter of Feb. 24th in regard to the pump that you furnished us:
Will say that this pump is the best pump that we have ever purchased and think that it is the best pump made, and we are very much pleased with the results we get from it. We are glad to recommend it to any one who is in the market for a sand pump, on account of its simplicity and durability and high standard of efficiency.
Thanking you for the past favors, we are,
Yours truly,
PRICE SAND CO.
By Lee Price.

AMSCO

SAND AND GRAVEL PUMPS



WRITE FOR OUR BULLETIN NO. 72

AMERICAN MANGANESE STEEL CO.

McCormick Building

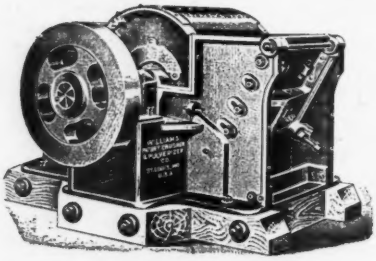
CHICAGO, ILLINOIS

Eastern Sales Office
New Castle, Del.

New York Office, 30 Church St.

Foundries, Chicago Heights, Ill., and New Castle, Del.

FROM 14" TO 18" CUBES TO 1½"- 1"- ¾"- ½" IN ONE OPERATION



BY using Williams Jumbo Crushers to take the feed from the very large Gyratory Crushers, the smaller or intermediate crushers, which were formerly necessary, can be eliminated as the Williams Jumbo Crusher will reduce these large cubes ranging in size from 14" to 18" to a product either 1½"-1"-¾" or ½". Capacities from 60 tons per hour to 200 and 300 tons per hour. Complete description of this extraordinary crusher is given in

BULLETIN NO. 85

THE WILLIAMS PAT. CRUSHER & PULVERIZER CO.

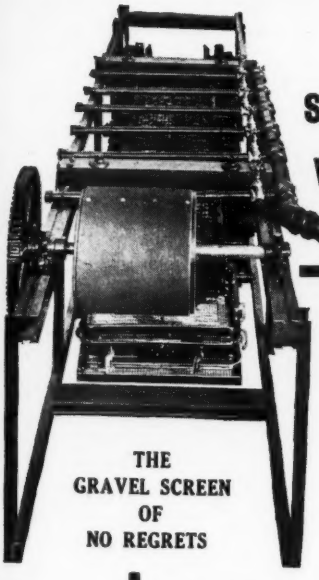
Gen'l Sales Dept., Old Colony Bldg.,

CHICAGO

A CU. YD. A MINUTE FROM STONE CAR TO WAGON WITH THE "BURCH"

One user of Burch unloaders even reports four loads in three minutes! One minute per load is everybody's average. You can see that there are no waiting wagons at that rate; and it rids you of shovelers' wages. It's practical, strong and rapid and easy to operate. A hauler designed it, and haulers are enthusiastic over it. Simple, compact, and reasonably priced. Write us for particulars—today.

THE BURCH PLOW WORKS COMPANY, Crestline, O.



THE GRAVEL SCREEN OF NO REGRETS

SCREENING AND WASHING FOR LESS THAN 1C PER YARD

1c a yard is the figure at which an actual commercial plant turned out 60 yards per hour of perfectly graded and clean sand and gravel of five different sizes. In the plant shown below, the E & S Shaker Screen with washer attachment replaced a $30,000 outfit of a different make, part of which still standing is shown on the left of the photo.

E & S SHAKER SCREEN WITH WASHER ATTACHMENT

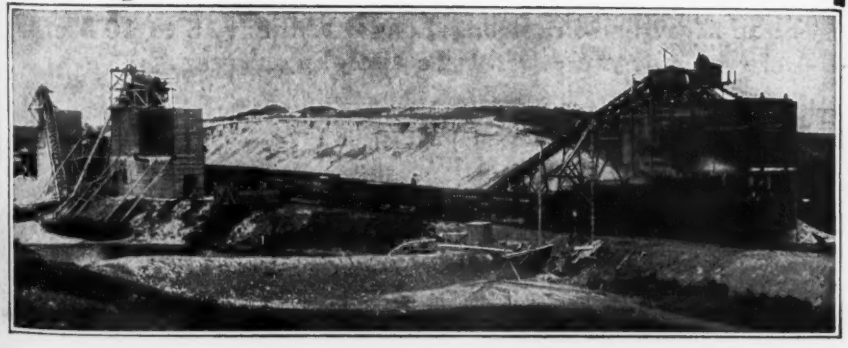
is simply the latest of the great efficiency and economy inventions that are bound to develop from time to time in every industry. It has been in practical use for 6 years. It has proved its distinctive merit beyond question. Exactly eccentric motion gives the screens a decided "throw," thus turning out more material at less cost than any other outfit of the same capacity.

There are a score of reasons, every one vital, to you, why you should give the E & S screening outfit your immediate and careful investigation. Start it out by dropping us a line of inquiry today.

WE DESIGN COMPLETE PLANS

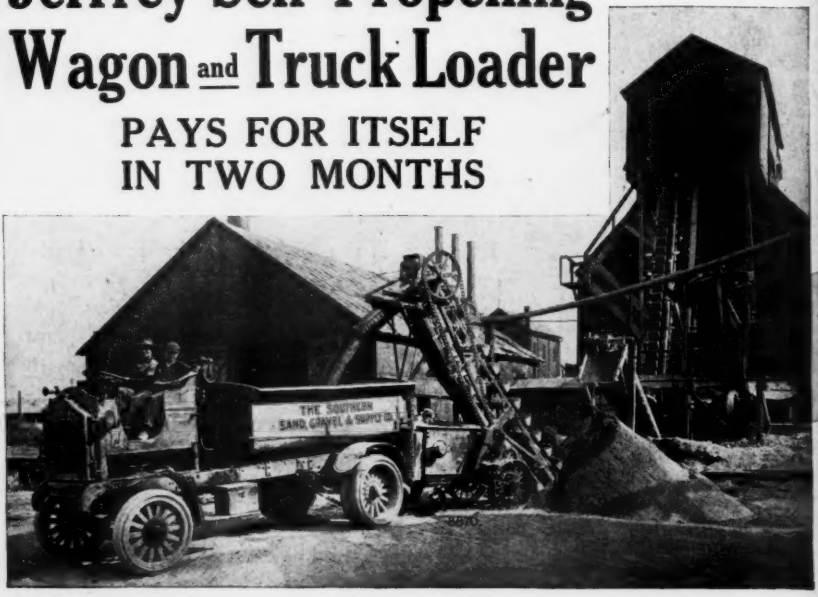
The EXCAVATING & SCREENING MACH. CO.

748 SECURITY BLDG., MINNEAPOLIS, MINN.



Jeffrey Self-Propelling Wagon and Truck Loader

PAYS FOR ITSELF IN TWO MONTHS



Mr. David Broadfoot, Supt. of the Southern Sand & Gravel Co., Columbus, *says:*

"With the use of our Jeffrey Loader, we can load each of our 7-ton Sternberg Trucks with Sand and Gravel in six to eight minutes.

"We figure that the machine paid for itself in the first two months we had it. We loaded 187 two-yard wagons with it in one afternoon.

"Are pleased to recommend the Jeffrey Self-Propelling Loader to any prospective purchasers, as we are thoroughly satisfied and cannot speak too highly of it."

The Jeffrey Self-Propelling Loader Will Save 5 to 10 Men for you—operated entirely by one man.

Tell us your local conditions
and send for **Bulletin 177-C**

The Jeffrey Manufacturing Co.

990 North Fourth Street, Columbus, Ohio